PROCEEDINGS

OF THE

Hawaiian Entomological Society

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PROCEEDINGS OF THE HAWAIIAN ENTOMOLOGICAL SOCIETY

Volume VI, 1924-1926

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Vol. VI, No. 1. For the Year 1924. August, 1925

JANUARY 3, 1924.

The 217th meeting of the Hawaiian Entomological Society was held in the entomological laboratory of the experiment station of the Hawaiian Sugar Planters' Association, President Swezey presiding. Other members present: Bryan, Giffard, Timberlake, Willard, Bissell, Ehrhorn, Rosa, Crawford, and Fullaway.

The minutes of the previous meeting were read and approved with corrections.

The report of the Secretary that the accounts of the Treasurer for 1923 had been audited and found correct was accepted.

The Executive Committee reported the selection of Mr. Rosa as librarian; Mr. Timberlake, custodian of collections; and Mr. Swezey editor for 1924.

The interest of the Society in the arrangements for the Food Conservation Congress to be held in Honolulu in the summer of 1924 was discussed, and it was decided that Mr. Muir should represent the Society in this respect. Mr. Crawford offered the following resolutions in connection with the same subject, which were adopted:

"The Hawaiian Entomological Society recommends that a suitable guide book be printed by the Pan-Pacific Union for the benefit of the delegates who attend the forthcoming Food Conservation Congress in 1924, this proposed pamphlet to give information in sufficient detail concerning the points in Hawaii which may be visited by the delegates. In addition to various points of interest throughout the Islands, there should be special

sections in the guide devoted to entomological, zoological, and botanical features which should be brought to the attention of our visitors. The Hawaiian Entomological Society volunteers its assistance in preparing the entomological portions of this guide.

"The Hawaiian Entomological Society recommends that the general subject of economic entomology and such features of quarantine as may fall under it be combined into one section at the forthcoming congress. Where a conference is desired on interrelated subjects in entomology, plant pathology, and animal industry, it can be arranged for by the different chairmen."

NOTES AND EXHIBITIONS.

Insects of Ewa coral plain.—Mr. Bryan exhibited insects caught Christmas day, 1923, on the Ewa coral plain near the beach below the Magnetic Station: Various bruchids, including *Bruchus amicus* Horn were found, especially hiding in wiliwili seed pods. Bruchid parasites were very abundant under the algaroba trees along the beach, *Glyptocolastes bruchivorus* Crawf. and *Heterospilus prosopidis* Vier. Horn-flies were numerous upon cattle and horses, and other flies, including *Musca vicina* Macq. and *Stomorhina pleuralis* (Thomson), were continually caught. The little black roach with vermilion spots, *Euthyrrapha pacifica* (Coq.), and the conspicuous black and brown click beetle, *Melanoxanthus melanocephalus* (Thunb.) were also abundant The most interesting find was the harlequin cabbage bug, *Murgantia histrionica* (Hahn), abundantly in cop on a bush of *Capparis Sandwichiana.*

Coelophora inaequalis (Fab.).—Mr. Timberlake exhibited a specimen of the eight-spotted phase of this lady beetle, collected at Kaimuki on December 23, 1923. Larvae of this variety were liberated at Kaimuki in 1920, but no adults.

Zelus egg-parasite.—Mr. Timberlake also reported the introduction of a *Zelus* egg-parasite, *Phanurus* sp , collected and sent by Mr. Osborn from Cuernavaca, Mexico, where it occurs in the eggs of *Zelus rubidus*, a species larger than our *renardii.* The parasite has been reared on *renardii* eggs and several lots of individuals have been liberated on Ewa Plantation, where Mr. Muir observed them ovipositing in the eggs of *Z. renardii.*

The male individuals in this species appear very peculiar, having a large head, and black, ligulate wings. Individuals of this sex fight among themselves, and it is seldom a perfect specimen is found. It is usually the antennae that are bitten off. Mr. Osborn's material included also a species of *Telenomus* with yellow legs.

Pheidole megacephala Fab.— Mr. Ehrhorn reported an observation on this ant while swarming. The swarm was mostly queens. The striking part was the capturing of the queens and males by workers and soldiers when they lighted on the cement walk He exhibited some specimens in a vial, showing the workers and soldiers still attached to the feet of the queens and males. They seemed to hold these forms in place—for what purpose it was impossible to state.

Mr Fullaway reported observing the turrets of earth made by *Pheidole megacephala* about the entrances to their underground runways after heavy rains.

Mr. Ehrhorn also reported the occurrence of the soft scale. *Lecanium aequale* Newstead on orchids in Hawaii, at the same time expressing the belief that it has been here unrecognized many years

Bruchus sp. near *coryphae* Oliv.—Mr. Swezey exhibited five specimens of a bruchid, which were captured by him at Barber's Point, Oahu, December 23, 1923, taken by sweeping on *Myoporum Sandwicense* bushes. This is the first record of the capture of this weevil in the Hawaiian Islands. Very little was found in literature regarding the species, but in a table of American Bruchidae by Fall (Tr. Am. Ent. Soc., 36, p. 164, 1910) these specimens run to the species *coryphae*, which was described by Olivier in 1795. It occurs in Georgia and Texas, and is probably not of economic importance or would have been mentioned in economic literature. The inference is that *coryphae* occurs in connection with the Corypha palm. It was thought that probably at Barber's Point it was breeding in algaroba beans, that being the only legume noticed, and the weevils were captured associated with other algaroba weevils, such as *Caryoborus gonagra* (Fab.), *Bruchus prosopis* Lec. and *B. sallaei* Shp. A specimen of *B. pruininus* Horn and one of *B. amicus*

Horn were also captured in the same circumstances. All of these were taken from bushes of *Myoporum*, where they had, no doubt, found a place of shelter or of hiding.

Glyptocolastes bruchivorus Crawf.—Mr. Swezey reported the capture of a single female of this bruchid parasite, at Barber's Point, Oahu, December 23, 1923. He also reared twenty-four specimens of it and four of *Urosigalphus bruchi* Crawf. from algaroba pods brought in from the same place.

Murgantia histrionica (Hahn).—Mr. Swezey also exhibited nine specimens of the harlequin cabbage bug which he had collected on *Capparis Sandwichiana* on the Ewa coral plain along the road about halfway between Gilbert and Barber's Point, December 23, 1923. The bug had no doubt bred on this plant, for one small nymph was also captured on it. This is the first instance of this bug being captured in the open in Hawaii It was previously recorded by Mr. Ehrhorn as captured in packing in furniture at the February 1 meeting of the Society. See Proc. Haw. Ent. Soc., III, No. 5, p. 370, 1918.

Supella supellectilium (Serv.).—Mr. Swezey reported collecting this roach in his house in Manoa December 23, thus extending its known range.

Pluchea indica.—Mr. Swezey called to attention that Professor Pollock had informed him that this is the name of the Eupatorium-like shrub so abundant in the Waikiki swamps, where it was first noticed a few years ago. He also stated that he had reported the occurrence of this plant at Nawiliwili, Kauai, September, 1920, but this fact had been inadvertently omitted from his note as printed in Proc. Haw. Ent. Soc., IV, No. 3, p. 524, 1921.

FEBRUARY 7, 1924.

The 218th meeting of the Hawaiian Entomological Society was convened at the usual place at 2:30 p. m. The following members were present: President Swezey presiding, and Messrs.

Bissell, Bryan, Crawford, Ehrhorn, Giffard, Rosa, Whitney. Timberlake, Wilder and Willard.

Mr. Willard was appointed acting secretary-treasurer to serve during the absence of Mr. Fullaway from the Territory.

The minutes of the previous meeting were read and approved.

Mr. Swezey reported a communication to the H. S. P. A. Experiment Station from the National Southeastern University, College of Agriculture, Nanking, China, which stated that fire had destroyed their library. Upon motion by Mr. Crawford, it was voted that the Society donate a set of its Proceedings to them, together with any other duplicate scientific papers that it might have.

Upon motion by Mr. Ehrhorn, it was voted that the Society donate a set of its Proceedings and other duplicate scientific papers to the Imperial Plant Quarantine Station of the Department of Agriculture and Commerce at Yokohama, Japan.

PAPERS.

"Diptera of Hawaii."

BY E. H. BRYAN, JR.

(Withdrawn for publication elsewhere.)

NOTES AND EXHIBITIONS.

Ceratitis capitata Weid.—Mr. Bryan exhibited specimens of the fruit of *Terminalia pallida*, which were infested with the larvae of this fruit-fly, and from which he had bred adult specimens. He stated that the tree was imported from the Philippines, and was growing behind the chapel of Kamehameha Schools.

Lachnus tujafilinus (Del Guercio).—Mr. Ehrhorn exhibited specimens of this Aphid, found on *Thuya orientalis*, Manoa Valley, January 27, 1924. The tree is eight years old, and was obtained from the Government Nursery on King Street. He also found a specimen on a Thuya tree in Kamanele Park, Manoa Valley, which was five years old and also obtained from the Government Nursery.

Conibius sp.—Mr. Ehrhorn exhibited a vial containing a large

number of beetles found congregated under a board at the Division of Plant Inspection Station, Honolulu, January 7, 1924. He stated that it was *Conibius* sp. near *brunnipes*, and had been reported before.

New spider.—Mr. Ehrhorn exhibited a spider which is apparently new to Hawaii. He found it January 27, 1924, in a box of Amaryllis bulbs in the basement of his house, where they had been removed for resting.

Xylocopa varipuncta Patton.—Mr. Ehrhorn exhibited a nest of this bee in a six-inch limb of an avocado tree. There were six males and sixteen females in the nest, where they seemed to want to stay, it being necessary to use kerosene to drive them out.

Mylabris sallaei (Shp.).—Mr. Bissell reported breeding this bruchid from green and ripe pods of algaroba collected June 27 to 30, 1922, in six localities: Kawaihae to Napoopoo, on the Island of Hawaii; Kawaihae and Kiholo, on the beach; Kiholo, from a single tree growing one mile up the mountain from the beach on Pahoehoe, where there was no other vegetation except sparse grass.

Phidologiton sp.—Mr. Whitney exhibited a large number of specimens of this ant, taken in quarantine in a basket of yams from China.

Phlocophagosoma tenuis (Gemm.).—Mr. Swezey reported the collection of this weevil by Mr. Wilder at Ulupalakua, Maui. A beetle that was collected by Dr. Perkins on Oahu, and considered by him to be an immigrant from Fiji. It had not been collected recently by local entomologists, and this is the first record from Maui.

Eupelmus setiger Perkins.—Mr. Swezey exhibited a specimen of this interesting eupelmid, which was reared from a larval case of *Hyposmocoma trimaculata* Walsm., collected on bark of Kukui in Waianae Mountains, January 27, 1924.

Levuana iridescens Beth.-Baker.—Mr. Ehrhorn exhibited a small box showing all stages of this insect, a serious pest on

coconut palms in Fiji. This exhibit was sent to him by the Government Entomologist at Suva.

Bruchus sp. near *coryphae* Oliv.—Mr. Ehrhorn exhibited, also, specimens of this bruchid, which were reared from seeds of *Ipomoea pes-caprae*, by Mr. E. L. Caum. The seeds were collected in an empty lot at the corner of Queen and Richard Streets, in Honolulu.

MARCH 6, 1924.

The 219th meeting of the Hawaiian Entomological Society was held at the H. S. P. A. Experiment Station at 2:30 p. m., President Swezey presiding. Other members present were Messrs. Bissell, Crawford, Ehrhorn, Rosa, Timberlake, Whitney, and Willard.

The minutes of the 218th meeting were read and approved.

Upon motion of Mr. Crawford, it was voted to comply with the request of The Science Museum of London that the Society donate a full set of its Proceedings to their library and place them on the mailing list for future publications.

NOTES AND EXHIBITIONS.

New records of Hawaiian ants.—Mr. Timberlake exhibited specimens of three ants, two of which have not been recorded heretofore from these islands, and the third previously unrecognized locally. These three species have been determined by Dr. William M. Wheeler. *Epitritus wheeleri* Donisthorpe. Three specimens collected by Mr. Swezey in a cane stool at Waimanalo, Oahu, June 30, 1922. The species was described from Honolulu in 1916. (Ent. Record 28, p. 121.) *Monomorium fossulatum seychellense* Emery. Several males of this subspecies were collected in Honolulu during the summer of 1916, the earliest one being dated May 2, 1916 (Timberlake); workers and one female were taken by Mr. Swezey at Puuloa, Oahu, April 10, 1922, nesting in the ground in a canefield. Several females were taken by Mr. Bryan in Makiki Valley, Oahu, September 30, 1922, and Mr. Pemberton collected workers at Hono-

kaa, Hawaii, in September, 1922. *Monomorium latinode* Mayr. A series of workers of this species was sent in to the Experiment Station from Nuuanu Valley in July, 1923.

Coleoptera collected in dead sisal.—Mr. Bissell exhibited specimens of the following Coleoptera which he collected in dead sisal back of the United States Experiment Station, Honolulu, February 14 and 18, 1924. *Blapstinus* sp., *Gonocephalum seriatum* (Boisd.), *Oxydema fusiforme* Woll. (*Pseudolus hospes* Perkins), *Scyphophorus* sp. (near *acupunctatus*). Of the *Scyphophorus* sp. he found numerous adults which were dead and mostly broken, dead pupae and larvae in pupal cases, and about two hundred pupal cases, which were constructed of the heavily massed fibers of the sisal leaves. A few of the cases contained dead larvae and pupae, but most of them had emergence holes which were usually turned toward the base of the leaf. The plant-stems had many holes, apparently made by the beetles passing from the leaf to the interior, or vice versa. A few adults and pupal cases were found attached to the inside of the stem, the pith of which was badly riddled by insects. One adult was found with a small hole in the anal end which may have been made by a dermestid. One dermestid larva and one cast skin were found in the plant. One dying sisal plant was examined, but no evidence of *Scyphophorus* was found.

Staphylinid beetle.—Mr. Swezey exhibited a large black staphylinid beetle collected by G. P. Wilder in cow dung at the Dowsett ranch above Kealakekua, Hawaii. It is the same species as a specimen exhibited at a previous meeting by Mr. Bissell, who stated that Mr. Pemberton had found it feeding on fruit-fly larvae in guavas on the ground.

Bruchus sp. near *coryphae* Oliv.—Mr. Swezey exhibited capsules of *Ipomoea pes-caprae* with the eggs of this bruchid. They are laid individually, of a greenish color, oval, and the surface thimble-like.

Pseudaphycus utilis Timb.—Mr. Swezey reported having bred two specimens of this Mexican parasite of the avocado mealy bug from the Waianae Mountains. A small amount of the mealy bug was observed on guava at a place on the firebreak

trail which skirts the Waianae Mountains beyond the Schofield Barracks target range at an elevation of about 1600 feet. This parasite was introduced in 1922. It was never distributed to that region, but has reached it of itself, indicating the likelihood of its very wide spread on this island.

Monopis meliorella (Walk.).—A specimen of this moth was exhibited by Mr. Swezey, captured by him at light at Lihue, Kauai, May 13, 1923. It is the first record of this moth on Kauai.

Chloridea obsoleta (Fabr.).—Mr. Swezey reported having found four caterpillars of this moth feeding on leaves of *Myoporum sandwicense* at Kolekole Pass, Waianae Mountains, February 10, 1924. This adds another to the list of food plants of this moth in Hawaii. After the Myoporum leaves were exhausted, these larvae fed on green tomatoes and the fruit of eggplant, but died before reaching full growth.

Paratenodera sinensis (Sauss.).—Mr. Swezey stated that Mr. Kutsunai had reported the finding of an adult praying mantis in a house at the Sugar Planters' Sub-Station, in the back part of Manoa Valley, February 19. A number of egg masses secured from Kohala, Hawaii, had been placed there in June, 1922. This is the first evidence of the insect having become established from these.

Chlorochroa uhleri Stal.—A specimen of this large green bug was exhibited by Mr. Swezey. It had been found by Mrs. Swezey, February 7, in a head of lettuce from California. It well illustrates how an occasional immigrant insect may arrive. This bug was probably hibernating in the lettuce head.

Rhyncogonus saltus Perk.—Specimens of this weevil were exhibited by Mr. Swezey. He had collected a good series (three dozen) on *Campylotheca menziesii* at Kolekole Pass, Waianae Mountains, February 10, 1924. This is the same locality where he had collected the only specimen previously known, in 1920. It has been named and described by Dr. Perkins, but the description has not yet been published.*

*Published in Proc. Haw. Ent. Soc., V, p. 379, 1924.

Eurytomid from Zelus eggs in Ecuador.—Mr. Timberlake exhibited specimens of a peculiar eurytomid which had been reared by Dr. F. X. Williams from *Zelus* eggs, collected at Tena, Ecuador, in May, 1923.

APRIL 3, 1924.

The 220th meeting of the Hawaiian Entomological Society was held at the usual place at 2:30 p. m. Members present, besides President Swezey, who presided, were Messrs. Bissell, Crawford, Giffard, Muir, Rosa, Timberlake, Wilder, and Willard.

Minutes of the previous meeting were read and approved as corrected.

PAPERS.

"Some Maui Insect Notes."

BY O. H. SWEZEY.

NOTES AND EXHIBITIONS.

Perissopterus carnesi Howard in Hawaii.—Mr. Timberlake exhibited specimens of this species from Makiki, Oahu. One specimen was taken on *Schinus* infested with *Saissetia nigra* (Nietn.) and other scales on February 10, 1924. Later, from material collected at that time, a small series was reared which apparently issued from *Saissetia*. The species is known to be a secondary parasite, and other parasites reared from the same material were *Scutellista*, *Tomocera*, *Aneristus*, *Microterys*, and *Quaylea*. This is probably the species which Kotinsky reported was introduced from China in the summer of 1906. In 1913, Fullaway recorded a *Perissopterus* from *Lepidosaphes* in Honolulu, which is presumed to have been the same species.

Hawaiian Ophionines.—Mr. Timberlake exhibited some of the rarer Hawaiian Ophionines, including the following:

Enicospilus pseudonymus Perkins.
One female from Haleakala, Maui (5000 feet).

Enicospilus tyrannus Perkins.
One female from Twenty-nine Miles, Hawaii, taken at light.

Enicospilus ashmeadi Perkins.
Kohala Mountains and Pahala, Hawaii.

Erymotyloides orbitalis (Ashmead).
Halemanu and Kaholuamano, Kauai.

Pycnophion molokaiensis Ashmead.
Waialeale and Kaholuamano, Kauai.

Pycnophion fuscipennis Perkins.
Two males and one female from Haleakala, Maui, and type female from Kauai.

Banchogastra nigra Ashmead.
Small series from Pahala and Kilauea, Hawaii.

A New Mantis From Kauai.—Mr. Swezey exhibited a fine female mantis received April 1, from Mr. C. B. Hofgaard, Waimea, Kauai, which is different from any before known in the Islands.

Antlion on Hawaii.—Mr. Swezey presented the following notes on observations made by Mr. W. H. Meinecke:

"On August 9, 1923, at Kapulehu, Kau, Hawaii, a dragonfly was seen on the wing eating an antlion. On July 1, 1923, an antlion was observed flying across the Government road below the old prison camp, west of Kilauea Military camp, Island of Hawaii."

MAY 1, 1924.

The 221st meeting of the Hawaiian Entomological Society was held at the usual place, with President Swezey presiding. Other members present were Messrs. Crawford, Ehrhorn, Muir,

Timberlake, and Willard. Mr. A. C. Wertheim, a member of the Nederland Entomological Society, was a visitor.

The minutes of the 220th meeting were read and approved.

PAPERS.

"Notes on California Psyllidae."

BY D. L. CRAWFORD.

"The Homopterus Genus Mesohomotoma (Psyllidae or Chermidae)."

BY D. L. CRAWFORD.

"The Genus Macrohomotoma (Psyllidae or Chermidae)."

BY D. L. CRAWFORD.

"The Tomato Hawk-Moth in Hawaii."

BY O. H. SWEZEY.

NOTES AND EXHIBITIONS.

Hadronotus.—Mr. Timberlake reported that this parasite, recorded as a *Telenomus* in these Proceedings, Vol. V, p. 9, really is a *Hadronotus* and not a *Telenomus.*

Pseudaphycus utilis Timb.—Mr. Timberlake exhibited specimens of *Pseudococcus nipae* on guava leaves collected by Mr. Quan Chock near Waikane, Oahu, on April 30, 1924, and which were heavily parasitized by *Pseudaphycus utilis.* This parasite was introduced from Mexico in 1922, and has practically exterminated its host from Honolulu and vicinity so that it is now necessary to go to the more remote parts of the Island to find the mealy bug in quantity. From the indications shown by the Waikane specimens, it will not be long before the host disappears also on windward Oahu.

Hawaiian Formicidae.—Mr. Timberlake read portions of a recent letter from Dr. W. M. Wheeler concerning two Hawaiian ants. The little yellow ant, which is now so abundant in Honolulu, is identified by Dr. Wheeler as *Plagiolepis mactavishi*

Wheeler, and there is possibly some error of identification in the recording of *P. exigua* from the Islands.

The *Brachymyrmex,* which was taken by Dr. Lyon in 1914 in orchid baskets in Honolulu, according to Dr. Wheeler is apparently *B. heeri* Forel, var. *aphidicola* Forel. This variety was originally described from Bermuda, but later found in Paraguay and other parts of South America. Dr. Wheeler was not absolutely certain of the identification, as he had no specimens of the variety for comparison, which had been authentically named by Forel.

JUNE 5, 1924.

The 222nd meeting of the Hawaiian Entomological Society was convened at the usual place at 2:30 p. m., President Swezey presiding. Other members present: Messrs. Crawford, Ehrhorn, Rosa, Wilder, and Willard.

The minutes of the previous meeting were read and approved.

Upon motion by Mr. Ehrhorn, it was voted to send a set of our Proceedings to the Natural History Survey Library, Urbana, Illinois, and request that this Society be put on their mailing list.

PAPERS.

"Psyllidae of India."

BY D. L. CRAWFORD.

(Withdrawn for publication in "Records of Indian Museum.")

"Psyllidae of South America."

BY D. L. CRAWFORD.

(Withdrawn for publication in "Broteria.")

NOTES AND EXHIBITIONS.

Coconut leaf-roller at Molokai.—Mr. Swezey reported that he observed in a large coconut grove near Kaunakakai, Molokai, May 25, that the leaves were in a very perfect condition. There was very little injury by the coconut leaf-roller *Omiodes black-*

burni (Butl.), less than he had ever seen anywhere in the Islands. Examination of leaves where there was injury by the caterpillars, brought to light numerous parasite cocoons. There were about a dozen of these cocoons in one place within a space of three inches. Parasites had already issued, but in another place a living cocoon was found, from which later the parasite *Cremastus hymeniae* issued. It has been known that this parasite attacked the coconut leaf-roller, as well as many other species of leaf-rollers, both native and introduced, but they had not been found so abundant anywhere or so effective as in the present instance. It is no doubt due to it that the coconut leaves are so nearly perfect in the grove mentioned near Kaunakakai.

Amaranth Jassid.—Mr. Swezey reported collecting the little green amaranth Jassid on amaranth at Kaunakakai, Molokai, May 25. It is the first record of its occurrence on that island.

Habits of the mango weevil.—Mr. Wilder exhibited specimens of the mango weevil *Sternochaetus mangiferae* (Fabricius). He had observed them crawl down the stems and onto the mango to oviposit. He stated that they were very easily alarmed, and that if they saw the observer they immediately ran up the stem to their hiding places, probably under the rough bark of the tree.

JULY 3, 1924.

The 223rd meeting of the Hawaiian Entomological Society was held at the H. S. P. A. Experiment Station, President Swezey in the chair. Other members present: Messrs. Crawford, Ehrhorn, Rosa, and Willard.

The minutes of the previous meeting were read and approved.

The Acting Secretary proposed Mr. Alfred Lutken of the United States Bureau of Entomology for active membership in the Society.

PAPER.

"Notes on Hawaiian Psyllidae."

BY D. L. CRAWFORD.

NOTES AND EXHIBITIONS.

Borer grubs in pine packing-box.—Mr. Swezey exhibited two alcoholic specimens of borer grubs from a pine packing-case from Youngstown, Ohio. This serves as another illustration of the opportunities that insects have for arriving here, and is one way to account for some of the chance immigrants that are found from time to time. In this case, if the larvae had remained in the wood undisturbed until the mature beetles were formed, there would probably have been no likelihood of the species becoming established, as it probably was a species occurring only in pine trees, of which none would be found for it in Honolulu.

Chalcolepidius erythroloma Cand.—Mr. Swezey exhibited preserved full-grown larva and pupa of this large elaterid beetle. Two larvae were found in a rotten kukui log in Niu Valley, January 13, 1924. They are predacious and had been fed on pupae of the cane-borer, until recently when one of them had pupated.

AUGUST 7, 1924.

The 224th meeting of the Hawaiian Entomological Society was held at the Experiment Station of the H. S. P. A., in joint session with the section on Plant Quarantine, Plant Entomology, and Plant Pathology of the Pan-Pacific Food Conservation Conference. The Society was honored by the attendance of the following Conference delegates and visitors: Delegates—Dr. L. O. Howard, Chief, Bureau of Entomology, U. S. Department of Agriculture, and Chairman, First Pan-Pacific Food Conference; Dr. C. L. Marlatt, Chairman, Federal Horticultural Board, Washington, D. C.; Dr. Royal N. Chapman, Associate Professor of Animal Biology and Entomology at University of Minnesota; Dr. Herbert Osborn, Research Professor, Ohio State University; D. S. North, Plant Pathologist to Colonial Sugar Refining Co., Sydney, N. S. W.; Dr. J. B. Johnston, Dean College of Science, Literature and Arts, University of Minnesota; Dr. Theo. D. A. Cockerell, Professor of Zoology, University of Colorado. Visitors—Q. C. Chock of the Board of Agriculture and Forestry,

Honolulu, and Charles F. Mant of Honolulu. Besides President Swezey, who presided, the following members were present: Messrs. Crawford, Ehrhorn, Giffard, Lutken, Pemberton, Rosa, Willard, and Williams.

The minutes of the 223rd meeting were read and approved.

Upon motion of Mr. Giffard, the rules were suspended and the Secretary cast a unanimous ballot, electing Mr. Alfred Lutken, of the United States Bureau of Entomology, an active member.

As moved by Mr. Giffard, it was voted that the President and Acting Secretary draft a resolution of condolence to be sent to Mr. and Mrs. R. H. Van Zwaluwenburg, and that a copy be placed in the files of the Society.

The meeting was opened by President Swezey for papers and discussions, prepared for the regular Conference Section session. Two very interesting papers were presented, the first being:

"Economic Entomology in New South Wales," brought from the Government Entomologist of N. S. W. by Sir Joseph H. Carruthers. This paper was presented by Mr. Swezey, who called attention to the more important parts.

"Pests Attacking Stored Foods and Means of Control," by Dr. Royal N. Chapman, was the second paper presented, and presented some very interesting methods now being used to control these pests. These papers, together with the interesting discussion evoked by them, will be published elsewhere.*

Wasps From Tropical Countries.—Mr. Williams exhibited a box of these insects and made the following remarks:

This exhibit consists of *Larra* wasps and their prey from several tropical regions, and of *Podium* and *Trigonopsis* wasps and their prey from South America. The species of *Larra* prey on mole-crickets (Gryllotalpinae) and usually select a particular species. Unlike other wasps of Larridae, they do not make nests of any kind, but, driving the mole-cricket to the surface of the

*Proceedings of the First Pan-Pacific Food Conservation Conference, pp. 380, 387, 1925.

ground, there attack and parasitize it, laying the egg in a place where the host, which soon recovers from the stings, may not reach it. The mole-cricket is ultimately devoured by the wasp grub, which elaborates a cask-like cocoon in the cricket's burrow. The *Podium* wasps prey on cockroaches, and each species is more or less attached to a species of cockroach. The wasps, according to the species, store their paralyzed victims either in mud cells or in short tunnels in the earth. In two species observed, the egg is laid on the roach before it is passed into the nest by the wasp. A number of *Podium haematogastrum* Spinola from Para, Brazil, have already been liberated in Makiki Valley, Honolulu.

Statement by Dr. Howard.—I wish to place on record my appreciation of the Hawaiian Entomological Society. I have attended many meetings of entomological societies all over the world. Other entomologists collect insects. Formerly, I collected insects, but of late I have been collecting entomological societies, and one of the best specimens I have had is the Hawaiian Entomological Society of Hawaii. When you first began your publications, I read them as I do other publications from other parts of the world that are received at Washington. Now, when I get a copy of the proceedings of your society, I sit up nights to finish it: not that you are more clever than entomologists in other places, but you have a way of bringing out discussions that interests me enormously.

SEPTEMBER 4, 1924.

The 225th meeting of the Hawaiian Entomological Society was held at the experiment station of the H. S. P. A. on the above date. Present: O. H. Swezey, Chairman, and the following members: F. X. Williams, H. F. Willard, E. M. Ehrhorn, Joseph Rosa, L. A. Whitney, Alfred Lutken, and D. T. Fullaway, Secretary.

The minutes of the previous meeting were read and approved with certain corrections.

NOTES AND EXHIBITIONS.

Xiphidiopsis lita Hebard.—Mr. Ehrhorn reported finding a

female specimen of this insect on August 30, 1924, in his dooryard on Oahu Avenue, Manoa Valley.

Paratenodera sinensis (Sauss.).—Mr. Swezey exhibited a specimen of this insect which had been collected by Mr. Kutsunai at the H. S. P. A. Experiment Station grounds in upper Manoa Valley. This specimen was two-thirds grown when found, and mature at time of exhibition. It is the second one that has been recovered since egg-cases from Kohala were put out at the Experiment Station grounds two years ago, and is sufficient proof that the insect is now established there.

Dromaeolus perkinsi Sharp.—Mr. Swezey exhibited a specimen of this beetle collected by Mr. Ehrhorn at Waiahole, Oahu, on July 4, 1924. It was previously collected by Perkins in Kona and at Kilauea, Hawaii. This is the first record of its occurrence on Oahu.

New Immigrant Mirid Bug.—Mr. Swezey exhibited specimens of a small mirid bug collected on tomato vines in his garden in Manoa Valley, August 13, 1924. It is a species not hitherto noticed here, and its identity has not yet been determined.*

OCTOBER 2, 1924.

The 226th meeting of the Hawaiian Entomological Society was held in the entomological laboratory of the H. S. P. A. Experiment Station on the above date, Mr. Swezey presiding. Others present were Messrs. Williams, Illingworth, Giffard, Muir, Ehrhorn, Willard, Rosa and Fullaway, members, and D. C. Seaton, visitor.

No business transacted.

NOTES AND EXHIBITIONS.

Helcogaster sp.—Mr. W. M. Giffard exhibited a specimen of a beetle referred to this genus of the Family Malacodermidae,

*Determined later by Mr. E. P. Van Duzee of the California Academy of Sciences as *Engytatus geniculatus* Reuter, a bug which is spread across the Southern States, but is not recognized as a pest.

stating that it was close to, but apparently different, from *H. pectinatus* Shp. The latter species is represented by one example in the H. S. P. A. Experiment Station collection taken in Honolulu by D. T. Fullaway. Mr. Giffard's insect was captured in the dense forest near S. Kona Road, on the island of Hawaii, August 31, 1924. First record of occurrence outside of Honolulu. Dr. Perkins (F. H., III, p. 368) states that *Helcogaster pectinatus* is generally found in houses. There were no habitations for some miles where the Kona specimen was taken.

Mantids.—Mr. Ehrhorn exhibited a series of mantid species, the egg masses of which were taken in quarantine; later the mantids reared in his laboratory. He drew attention to the possibility of acclimatization occurring from such frequent introductions.

Urosigalphus bruchi Crawf.—Mr. Willard reported, on behalf of Mr. Lutken, rearing six individuals of this braconid from *Caryoborus gonagrus* (Fab.). Out of a dozen cocoons from pods of algaroba, six *Urosigalphus* were obtained. This parasite is also obtained from *Bruchus sallei* Shp.

Coptotermes and *Cryptotermes* on Hawaii.—Mr. Fullaway reported the species of these two highly injurious termite genera to be present in Hilo now. Examples of *Coptotermes intrudens* Oshima were collected on the Kuhio wharf, and the work of *Cryptotermes piceatus* Snyder was noticed at the Hilo Hotel in September, 1924. It is believed both species have been there for more than a year already.

Bruchus sp. near *coryphae* Oliv.—Mr. Swezey exhibited a specimen of this weevil collected on a car seat in a train, September 21, 1924, while traveling along the north coast of Oahu near Puuiki. He also reported finding this weevil on morning glory vines on roadsides in Ewa Plantation, September 23, 1924. Their eggs were quite numerous on seed pods of *Ipomoea tuberculata*. One adult had already issued from seed pods brought in.

Euscepes batatae (Waterhouse).—Specimens of this sweet potato weevil were exhibited by Mr. Swezey. He had obtained them from a tuberous root of *Ipomoea pentaphylla*, growing in canefield at Ewa Plantation, September 23, 1924. The root was

somewhat exposed above the surface of the ground, and had numerous exit holes from which beetles had issued. The vines attached to the root were also infested by the weevil, and had a number of the exit holes. Apparently, this is the first record in Hawaii of this weevil attacking any other plant than sweet potato.

Lagochcirus obsolctus Thoms.—An adult of this longicorn beetle was exhibited by Mr. Swezey, which had issued from a pupa found by him in a dead branch of *Euphorbia* on a ridge back of Hauula at an elevation of about 1000 feet, September 20, 1924.

Curtomcrus pilicornis (Fab.).—A specimen of this cerambycid beetle was exhibited by Mr. Swezey, which had just matured from a pupa collected in dead guava, September 28, 1924. Many larvae were found feeding beneath bark of recently cut trees of the waiwi guava on the Kahauiki ridge above Fort Shafter. A few pupae were found in cells which they had excavated in the wood for pupation. Mr. Swezey stated that he had often observed that felled guava trees and cut-off branches were usually considerably attacked by larvae of some beetle feeding under the bark, but this was the first time he had reared one to ascertain the species. He had also reared this species from dead *Eucalyptus*, *Datura* and *Acacia farnesiana*.

Syagrius fulvitarsis Pascoe.—Mr. Swezey reported finding the fern weevil as far west as Kahauiki, on a ridge in between Kalihi Valley and Moanalua Valley, directly above Fort Shafter. Only two or three *Sadleria* ferns were noticed, and they were badly eaten by the weevil, apparently would soon be dead. In cutting up several stems, cocoons were found in two places in the burrows of the weevil, which indicated that its parasite is present there.

Ceratitis capitata Wied.—Mr. Swezey reported rearing the Mediterranean fruit-fly from bananas. Two imperfect, injured, overripe fruits, of the largo or Mexican variety, that had ripened on the tree, were found to have maggots when examined September 10, and from September 23 to 29 fifteen flies were matured.

Lycaena blackburni (Tuely).—Mr. Swezey reported having found three larvae of this native butterfly on *Perrottetia Sandwicensis*, on the Manoa Cliffs Trail, Tantalus, August 16, 1924. One adult issued in due time, but owing to having been neglected it was ruined for a specimen. The species could be determined, however, and it is the first record of its feeding on this tree, the usual food plants of the larvae of this butterfly being koa and *Dodonaea*.

Scarcity of Roaches in Cafeteria.—Mr. Swezey reported that Mr. Landrum had told him of the entire absence of roaches at the cafeteria in the cannery of the Hawaiian Pineapple Co., at Iwilei, Honolulu. For the past several years the roaches had been a great nuisance there, but for the past two months there were none at all.

Veronicella leydigi Simroth.—Mr. Swezey stated that in a recent letter from Dr. T. D. A. Cockerell, Boulder, Colorado, this determination was given for the large black slug so common in Honolulu. Dr. Cockerell further stated that it was "Described from Queensland (where supposed to be introduced) and also known from New Hebrides. See Queensland Agricultural Journal, Vol. V, Pt. 1 (1899)."

Effect of Volcanic Dust on Insects.—Mr. Giffard reported that the infestation of the ohia thrips on his fuschias at Kilauea had been entirely removed by the volcanic dust which fell in that region during the summer of 1924.

Mr. Illingworth spoke of his experiences in China during the past year.

NOVEMBER 6, 1924.

The 227th meeting of the Hawaiian Entomological Society was held at the H. S. P. A. Experiment Station on the above date at 2:30 p. m. Mr. Swezey presided. Other members present were Messrs. Rosa, Lutken, Osborn, Williams, Giffard, Muir, and Fullaway.

The minutes of the previous meeting were read and approved.

Mr. Swezey proposed the name of Mr. R. H. Van Zwaluwenburg for membership.

Mr. Muir presented the following paper: **"List of the Genera of Cixiidae sens. lat."**

NOTES AND EXHIBITIONS.

Silaon rohweri Brid.—F. X. Williams reported finding this small larrid wasp, discovered some years ago by Bridwell at Ewa coral plain, as plentiful November 2, 1924, on the lowlands between Waimanalo and Makapuu, Oahu.

Aulacaspis fulleri Ckll.—Mr. Giffard reported as follows: Professor T. D. A. Cockerell writes me under date of October 13, 1924, that at the Chinese banquet held during the Pan-Pacific Conference in August last his attention was called to a scale infesting one of the table decorations. The latter was determined by Miss Eastwood, Botanist of the California Academy of Science, as *Aglaia odorata* (a Chinese stove-plant). Professor Cockerell states, "I did not know the species (of scale) offhand, and sent some to my friend Laing of the British Museum. He finds that it is *Aulacaspis fulleri* (Ckll.), which I described long years ago from South Africa and which apparently has not been found elsewhere.

Mr. Ehrhorn remarked that *fulleri* had been described as a variety of *crawii*, and Laing considers it a good species. He also noted that Cockerell claims that our *Phenacaspis eugeniae* is *P. dilatata.*

Sitotroga cerealella (Oliv.).—Mr. Fullaway reported rearing the Angoumois grain moth from corn sent to Honolulu from Waikii, Hawaii (Parker ranch), in October, 1924. He also reported that the chalcid parasite of army-worms, *Euplectrus platyhypenae* Howard, introduced from Mexico in 1923, has become established at Honokaa (Mr. Pemberton) and at Olaa (Mr. Starrett), Hawaii.

Pseudaphycus utilis Timb.—Mr. Swezey reported that *Pseudococcus nipae* (Mask.) was almost entirely absent from guava in Hauula Valley, September 20, 1924. A small shoot near the ground was found with a few leaves having a few of the mealy

bug. They were brought in to breed out the parasite. None issued, however, but, when examined later on, several of the mealy bugs were found, from which parasites had issued, and three were found to contain dead adult parasites, *Pseudaphycus utilis.*

Bruchus phaseoli Gyll.—Mr. Swezey exhibited specimens of this bean-weevil reared from *Dolichos lablab* seeds collected at Keawakalani, Molokai, in July, 1924, by C. M. Cooke, Jr. The locality is near the western end of the island. This is the first record of this weevil occurring on Molokai.

Nesidiorchestes hawaiiensis Kirk.—Mr. Swezey exhibited a specimen of this tiny brachypterous bug collected by him along the Firebreak Trail, Waianae Mountains, October 26, 1924. It was collected from his clothing as he sat among vines, eating lunch. Hitherto it has been recorded from the Koolau Mountains, and apparently this is the first record from the Waianae Mountains.

Neoclytarlus fragilis (Shp.).—Mr. Swezey exhibited a piece of a koa branch about six inches long and two inches in diameter, taken from a felled koa tree at about 2000 feet elevation on the ridge back of Fort Shafter, September 28, 1924. Up to October 19, 1924, four *N. fragilis* beetles had issued from the piece of wood. A species common on koa on Oahu, but not previously collected by him. Six *Ischiogonus palliatus* (Cam.) also issued, they having been parasitic on the larvae of *N. fragilis.*

From this same piece of wood, 175 scolytids had issued. They were of two or three species, species undetermined. The scolytids had fed in the wood, but the *N. fragilis* larvae had fed on the inner bark and outer sapwood, finally burrowing into the wood deep enough to form a cell for pupation and final transformation.

DECEMBER 4, 1924.

The 228th meeting of the Hawaiian Entomological Society was held on the above date at the H. S. P. A. Experiment Station, at the usual hour.

Mr. Swezey presided. Other members present were Messrs.

Williams, Illingworth, Rosa, Giffard, Muir, Van Zwaluwenburg, Bryan, Willard, and Fullaway.

The minutes of the last meeting were read and approved.

The Treasurer's report for the year was read and approved. H. F. Willard was appointed to audit the same, and reported that the accounts of the Society to December 1, 1924, according to his examination, were correct and agreed with the report in total.

The Editor reported that the Proceedings of the Society for 1923 would be ready for distribution in about two weeks.

Mr. R. H. Van Zwaluwenburg was duly elected to active membership.

A letter from the Zoological Society of London in regard to the financial arrangements for the continuation of the Zoological Record was read, and it was voted to take the same action on this matter as was done last year: namely, members of the Society to guarantee $25 to assist the publication.

Election of officers for 1925 resulted as follows: President, F. X. Williams; Vice-President, H. F. Willard; Secretary-Treasurer, D. T. Fullaway. Additional members of Executive Committee: W. M. Giffard, O. H. Swezey.

PAPERS.

Mr. Fullaway presented the following paper by title on behalf of Mr. Timberlake:

"Descriptions of New Chalcid-Flies From Panama and Hawaii (Hymenoptera)."

Mr. Giffard presented a paper entitled **"A Revision of the Hawaiian Cixiidae and Description of Species."**

Mr. Muir withdrew the paper presented by him at the November meeting and presented another, entitled **"The Status of the Anterior Processes in the Male Genitalia of Homoptera."**

Mr. Bryan presented a paper on **"The Levuana Moth in Fiji,"** and exhibited specimens.

Mr. Swezey then read his presidental address, entitled

"The Insect Fauna of Trees and Plants as an Index of Their Endemicity and Relative Antiquity in the Hawaiian Islands."

NOTES AND EXHIBITIONS.

Toxoptera aurantii (Fons.).—Mr. Fullaway reported this aphid from the young leaves of Ohia-ha, at the forest edge on the land of Keokeo, Kona, Hawaii, November 13, 1924. They were engaged in making the synchronous movements reported of aphids elsewhere.

Xiphidiopsis lita Hebard.—Mr. Fullaway reported this grasshopper from the Kona district of Hawaii, collected November 12, 1924, at Miss Ella Paris' homestead. First record from Kona.

Dryophthorus homocorhynchus Perkins.—Mr. Swezey exhibited specimens of this weevil collected by him November 23 from a dead *Dracaena* tree in the edge of the forest at Pupukea at about 1000 feet elevation. Quite a good many were present in the tree, chiefly in and beneath the rotten bark. Fourteen specimens were collected. The species was described from Kauai, where it was collected by Perkins at Koholuamano at 4000 feet elevation. Apparently, it has not been recorded from elsewhere until now.

Tricentrus albomaculatus Distant.—Mr. Swezey reported that he had sent specimens of the membracid that is sometimes found abundantly about Honolulu, to Professor W. D. Funkhouser of the University of Kentucky for determination. Professor Funkhouser had replied as follows: "The species is *Tricentrus albomaculatus* Distant, of which I have specimens determined by Distant. It shows considerable variation. It is not only abundant in India, but I have a long series from Singapore and another series from the Island of Penang." This insect is first referred to on page 188 of Vol. 2, Proc. Haw. Ent. Soc., 1912. It has increased of recent years and become more widely spread in Honolulu and its outskirts. It has been found breeding on *Eucalyptus, Sesbania,* Ilang-ilang and pigeon peas.

Pseudaphycus utilis Timb.—Mr. Swezey reported on the establishment of this parasite at Honokaa, Hawaii, and at Ulapalakua,

Maui. Eleven specimens had emerged from *Pseudococcus nipae* on guava leaves brought in by Mr. Osborn from Ulapalakua, November 12. Fourteen specimens had issued from similar material sent in by Mr. Pemberton from Honokaa, November 20.

Scymnus dorcatomoides Weisse.—Mr. Swezey exhibited a specimen of a small lady beetle that appeared to be this species, or near it, which he caught on a pepper tree (*Schinus terebinthifolius*) in Manoa Valley, November 27, 1924. It was not learned what its host might have been, as there seemed to be no infestation by mealy bugs, aphis, or scales. There appears to be no record of the introduction of the species. But it must be one of the early introductions of Koebele which has hitherto escaped notice. The species is Oriental, and there are specimens in the Koebele collection from Japan, China, and Formosa.

Koeneniidae.—Mr. Muir exhibited specimens of a koeneniid (Order Palpigrade) found by Mr. Van Zwaluwenburg in soil of cane-fields at depths of seven to eleven inches on Oahu. This is the first record for the order in the Islands.

Small Carabid.—Mr. Van Zwaluwenburg exhibited a minute carabid beetle apparently without eyes, taken in soil at a depth of seven to nine inches on the grounds of the H. S. P. A. Experiment Station. The species is much smaller than any previously captured here.

Notes on Hawaiian Psyllidae.

BY D. L. CRAWFORD.

(Presented at the meeting of July 3, 1924.)

A small collection of Psyllidae submitted to me by Mr. O. H. Swezey is the basis for the following notes:

Trioza ohiacola Crawford is represented by a number of specimens from various parts of Oahu—Waimalu, Tantalus, and Kaala Mountain. One lot, from Tantalus, is of special interest, as these specimens were bred from galls on the leaves of *Metrosideros glaberrima.* These are very typical of the species, but another lot from the same locality bred from galls on the stems and buds of the same food plant (lehua) are not typical. These are closer to *Trioza iolani* Kirkaldy. It shows that these two species are very closely related, apparently now in the process of evolution.

Trioza iolani Kirkaldy is represented by specimens from Waimalu, Palolo, Tantalus, Konahuanui and Punaluu, all on Oahu, on Ohia lehua (*Metrosideros*).

Hevaheva perkinsi Kirkaldy is represented by specimens from leaf galls bred on *Pelea,* from Palolo, Mount Kaala, and Mount Konahuanui.

The same species occurs on Hawaii, several specimens having been taken by Swezey on the Upper Hamakua Ditch Trail, on leaves of *Pelea.* This is the first time this species has been found on Hawaii. The specimens differ from the Oahu representatives in having shorter hairs on the wing veins.

This species is now noted for the first time as occurring on Kauai, a number of specimens having been collected by Swezey at Alakai Swamp on August 22, 1921. The nymphs are reported as living free on the surface of leaves of *Pelea,* not forming galls. There seem to be two habits of larval life or else two species which are morphologically distinct, for one finds galls formed by this species on *Pelea,* and yet some individuals are found living free in the nymph stage and not forming galls. Both of these conditions have been noted on Oahu, while the

Notes on California Psyllidae

BY D. L. CRAWFORD.

(Presented at the meeting of May 1, 1924.)

The following species of Psyllidae (Chermidae) are represented in a collection made by Mr. P. H. Timberlake in 1920 in California:

Aphalara angustipennis Crawf.

This very common and widely distributed species is well represented in Timberlake's collection, the specimens having been taken on *Solidago* at Camp Baldy (elevation 4700 feet), August 24, 1920.

Euphalerus vermiculosus Crawf.

Two specimens of this mountain species were taken by Timberlake on Mount San Antonio (elevation about 6000 feet), on *Ceanothus* sp., August 22, 1920.

Trioza viridis Crawf.

One female of this apparently rare species was taken by Mr. Timberlake at Camp Baldy, Mount San Antonio (elevation 4700 feet), on August 21, 1920.

Trioza bakeri Crawf.

What appears doubtfully to be a specimen (female) of this species was taken by Timberlake at Bear Flats, Mount San Antonio (elevation 5500 feet), on August 22, 1920.

Trioza maura Frst.

Four specimens of this widely distributed willow psyllid were taken by Timberlake at Whittier, California, on *Salix*, sp., on August 11, 1920.

Psylla brevistigmata Patch.

Specimens of this species with its white markings on a red background were found by Timberlake on *Cercocarpus betulae-*

folius at an elevation of about 5500 feet on Mount San Antonio, California, on August 22, 1920. These agree closely with the typical specimens examined by me in the preparation of the monograph (U. S. Nat. Mus. Bul. 85, p. 153).

Psylla maculata Crawf.

This species was originally described* from one female specimen taken in Colorado and now deposited in the United States National Museum (Cat. No. 18,107). Three specimens probably belonging to this species are in Timberlake's collection, one male and two females. It is with some degree of uncertainty that these are referred to *P. maculata*, as there is some lack of agreement with the type, but, on the other hand, a species described on the basis of a single female is apt to be subject to some minor changes of description.

The two females agree rather well with the type in the shape and characteristics of the head and its appendages, but in the wings they lack the brown maculation found in the type female.

The male is like the type female in color and other wing characteristics, but the genal cones are relatively a little shorter, being not quite as long as the vertex. The male genitalia are as follows: Forceps nearly as long as anal valve, stout and heavy, tapering to a point, with the posterior edge black and smooth, while the remainder is tawny and pubescent; anal valve broadly elliptical in rear view, tapering to a rounded point at apex.

These three specimens were collected by P. H. Timberlake on August 22, 1920, on Mount San Antonio, California (elevation 5500 feet), on *Cercocarpus betulaefolius*.

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*U. S. Nat. Mus. Bul. 85, p. 141, 1914.

The Homopterous Genus Mesohomotoma (Psyllidae or Chermidae).

BY D. L. CRAWFORD.

(Presented at the meeting of May 1, 1924.)

The genus *Mesohomotoma* was erected in 1907 [1] by Kuwayama for the species *M. camphorae*, prevalent in Formosa on the foliage of camphor trees. To this genus there should be referred, also, several other species previously or subsequently described in other genera. Froggatt described two species of *Tyora*,[2] one of which *(T. hisbisci)* should certainly be referred to *Mesohomotoma*, while the other *(T. sterculiae)* belongs in still another genus, probably *Neocarsidara*. *Tyora indica* Crawford [3] also belongs in *Mesohomotoma*.

Tyora was erected by Walker [4] for the South Pacific species *T. congrua*, which is quite distinct from the other species referred to this genus. *Tyora congrua*, the type species, has a distinct pterostigma in the forewing, while *Mesohomotoma* species have none; *Tyora* has two pseudo-cross veins (callus), while *Mesohomotoma* has but one. In other respects, also, *Tyora* is very distinct, as in the less deeply cleft vertex.

Udamostigma was erected by Enderlein in 1910 with Froggatt's *Tyora hibisci* as type species. Later (1914) another species (new) was referred to this same genus. Both of these species should certainly be considered as congeneric with Kuwayama's *Mesohomotoma camphorae*, and inasmuch as this is the older of the two generic names, Enderlein's *Udamostigma* should be known as a synonym of the other. In wing venation, even to small details, and in characteristics of genital organs, these species are so similar that their congeneric relationships are unmistakable.

Proc. Haw. Ent. Soc., VI, No. 1, August, 1925.

[1] Trans. Sapporo Nat. Hist. Soc., Vol. II, p. 180, 1907, "Die Psylliden Japans," by S. Kuwayama.

[2] Proc. Linn. Soc. New South Wales, 1901, pp. 286-291.

[3] Phil. Jr. Science, Vol. XV, pp. 159-160, 1919.

[4] Ins. Saund., Homoptera, p. 111.

Description of Genus Mesohomotoma.

Head very deeply cleft in front, the antennae attached to the apices on each side of the cleft and enhancing the birostrate appearance of the head; genal cones wanting. Vertex with a prominent deep sulcus on each side of median cleft, extending out toward base of antennae. Anterior ocellus at the base of the median cleft. Antennae slender, usually about half as long as forewing, or in some species longer.

Thorax slender, pronotum relatively long. Hind tibiae with a spur at base and several (usually five) spines at apex. Forewings long and large, usually more or less pointed at apex, membrane thin; pterostigma not present, the radius extending straight to margin; a pseudo-vein or callus between radius (radial sector) and media, joining latter at its point of forking.

Type of genus: *Mesohomotoma camphorae* Kuwayama.

KEY TO SPECIES.

A 1. Body greenish yellow or straw color, without distinct stripes on dorsum.

B 1. Stem of cubitus twice as long as stem of medio-cubital vein; latter much less than half as long as stem of radius before its furcation.................... *M. camphorae* Kuwayama

B 2. Stem of cubitus only a little longer than stem of medio-cubital vein; latter more than half as long as stem of radius before its furcation.......................... *M. hibisci* Frogg.

A 2. Body brownish or rusty in color, at least the head being brown; dorsum with several longitudinal stripes of a paler color.

B 1. Forewing with several conspicuous black spots along posterior margin.............................. *M. lutheri* Enderlein

B 2. Forewing without black spots on posterior margin, except one at tip of clavus.................. *M. lineaticollis* Enderlein

M. camphorae Kuwayama.

Kuwayama—Sapporo Nat. Hist. Soc., Vol. II, p. 180, 1907.

This species is well figured and described by Kuwayama in the reference cited above. It is reported as abundant on camphor trees in Formosa.

M. hibisci (Froggatt).

Tyora hibisci Froggatt—Proc. Linn. Soc., New South Wales, 1901, pp. 286-291.

Udamostigma hibisci (Froggatt), Enderlein — Wissensch. Ergeb. d. Schw. Zool. Exped. nach Dem Kilimandjaro, Deutsch-Ostafrikas, 1905-1906, Hemiptera (Psyllidae), p. 138, 1910.

This species was described under the name *Tyora hibisci* by W. W. Froggatt on specimens collected in Brisbane, Queensland. That the species has a wider distribution, is indicated by the fact that specimens were collected at Suva, Fiji, in 1904, on Hibiscus foliage. These specimens were referred to me recently by the Hawaiian Sugar Planters' Association Experiment Station. Another specimen before me was taken by Koebele at New Caledonia, date not recorded. Probably the species has rather a wide distribution in the South Pacific, on Hibiscus. Froggatt gives a very good account of its life history and habits.

Enderlein, in 1910, erected a new genus for this species, apparently recognizing the fact that *Tyora congrua* is a very distinct type and not congeneric with Froggatt's species. To separate it generically, however, from *Mesohomotoma camphorae* is an error already pointed out above.

M. lutheri Enderlein.

Udamostigma lutheri Enderlein—Zool. Jahrb. 41, pp. 484-5, 1918.
Tyora indica Crawford—Philippine Jr. Science, XV, p. 159, 1919.

This species described by Enderlein in 1918 from specimens collected in Ceylon seems without doubt to be the same as *Tyora indica* Crawford, and as Enderlein's name has priority, the latter is sunk in synonymy.

There seems no good reason for holding either this species or *M. hibisci* Froggatt in a distinct genus as Enderlein has them, *Udamostigma* having nothing to separate it generically from *Mesohomotoma*.

This species, fully described in the references cited above, is apparently a widely distributed one, as it occurs in the South Pacific Islands, as well as in India and Ceylon. In the illustration of the wing of this species, as shown in the second citation above, the cross-vein (callus) was, by some oversight, omitted.

It is mentioned in the description, and should appear in the drawing. This species seems to be very close to *M. lineaticollis* Enderlein.

M. lineaticollis Enderlein.

Enderlein—Ent. Mitteilungen, III, No. 7-8, July, 1914.

This species, also occurring in Formosa, is said by Enderlein to be very similar to *M. camphorae*, differing apparently in color, in minor venational characters of the forewing and in the smaller genitalia of the male.

The Genus Macrohomotoma (Psyllidae or Chermidae).

BY D. L. CRAWFORD.

(Presented at the meeting of May 1, 1924.)

MACROHOMOTOMA Kuwayama.

This genus was erected in 1907 by S. Kuwayama [1] for a single species found in Formosa, *M. gladiatum* Kuwayama. In 1914 an African species, previously described under another generic name,[2] was referred by me to this genus and the two species compared.[3] Subsequently, additional specimens representing this genus have come to hand from Borneo, the Tenimber Islands, Southern China, and India. Some of these latter seemed to be so closely similar to the Formosa species that they were at first identified with that species,[4] but in reality there appear to be several quite distinct species. Eleven specimens apparently representing a new species of this genus were collected by F. X. Williams on *Ficus*, in the Philippine Islands.

One of the peculiarities of members of this genus is the strikingly large pterostigma, which frequently has the appearance of being an area (cell) surrounded by a very broad vein.

The genus appears to be closely related to *Pauropsylla* and belongs in the same subfamily with it, instead of in the Carsidarinae as earlier stated.

KEY TO THE SPECIES.

A 1. Stem of cubital veins less than one-third as long as basal cubital branch (Cu2); antennae as long as width of head, including eyes.

B 1. Stem of cubital veins about one-eighth as long as basal cubital branch; pterostigma broadly elliptical, clear; female genital segment very long and slender; vertex with a deep depression on each side of median line..........*M. nyasae* (Newstead)

B 2. Stem of cubital veins about one-fourth as long as basal cubital

Proc. Haw. Ent. Soc., VI, No. 1, August, 1925.

[1] Trans. Sapporo Nat. Hist. Soc., Vol. II, p. 179, 1907.

[2] Pseuderiopsylla nyasae Newstead, R. Bul. of Ent. Research, II, p. 105, 1911.

[3] Ent. News, Vol. XXV, p. 62, 1914.

[4] Philippine Journal Science, Vol. XV, p. 144, 1919 (*Pauropsylla apsylloides*), and Vol. XVII, pp. 353, 1920.

branch; pterostigma twice as long as broad, black at apex; vertex without deep depressions........*M. sandakana* n. sp.

A 2. Stem of cubital veins one-third to one-half as long as basal branch of cubitus; antennae usually about as long as width of head between eyes, sometimes longer.

B 1. Female genital segment about half as long as width of forewing; antennae not very slender; thoracic dorsum usually plain brown in color; pronotum without hairs.

C 1. Forewings without a dark stripe in cubital area; antennae thick, not longer than width of head between eyes, segments nearly half as thick as long..*M. gladiatum* Kuwayama

C 2. Forewings with a conspicuous black stripe along the cubital veins from the middle of the wing to the posterior margin; antennae a little longer than width of head between eyes, not very thick beyond the second segment..............................*M. striata* n. sp.

B 2. Antennae very slender, sometimes nearly as long as width of head, including eyes (chiefly in the males); female genital segment very long and slender, as long as greatest width of forewing; thoracic dorsum conspicuously spotted with large black or dark brown areas; pronotum with a row of hairs on hind margin..........................*M. williamsi* n. sp.

Macrohomotoma williamsi n. sp.

Length of body (male), 2.7 mm.; (female) 3.8 mm.; forewing (female), 5 mm. General color, brown to reddish brown, with ten to thirteen black or dark brown spots of irregular extent on thoracic dorsum; abdomen and venter light brown.

Vertex smooth, roundly convex, with a slight linear depression on each side of median line; frons small, but visible below front ocellus. Antennae about as long as width of head or often less, very slender, segments distad of III being three or four times as long as thick; terminal setae long.

Thorax large; pronotum with a row of delicate hairs along hind margin; metanotum with a pair of small horn-like processes. Forewings hyaline, acutely pointed, large; pterostigma nearly or quite twice as long as broad, broadest at base, often brownish at apex, half as long as radius; stem of cubital veins from one-third to one-half as long as basal cubitus (Cu2), and about equal in length to the stem of the medial and cubital veins beyond the forking of the radius.

Abdomen short. *Female* genital segment very long, longer than rest of abdomen or about as long as greatest width of forewing, slender and

tapering to acute point. *Male* forceps slender, a little longer than anal valve.

Described from five females and six males collected by F. X. Williams on *Ficus clementis*, on Mount Maquilling, Philippine Islands, elevation 1700 feet, May 6, 1921.

Macrohomotoma sandakana n. sp.

Body and wings about the same size as *M. williamsi*. General color, dark chocolate-brown on head and thorax, abdomen a little lighter color; surface conspicuously reticulated with fine lines.

Head very strongly deflexed, vertex smooth, scarcely marked by any depressions at all. Antennae slender, about as long as width of head, including eyes; segments I to IV yellowish or orange, V to VIII same, but tipped with black, IX to X black.

Forewings clear except a black spot at apex of pterostigma and one at tip of clavus. *Male* genitalia smaller than in *M. williamsi*.

Described from one male taken at Sandakan, Borneo, by C. F. Baker, and with several other specimens previously identified with *M. gladiatum* Kuwayama, with some difference, however, noted, and the possibility of its being a distinct species remarked.

Macrohomotoma striata n. sp.

Length of body (female), 4.2 mm.; forewing, 5 mm. General color brown, with indistinct splotches of slightly darker brown on thoracic dorsum.

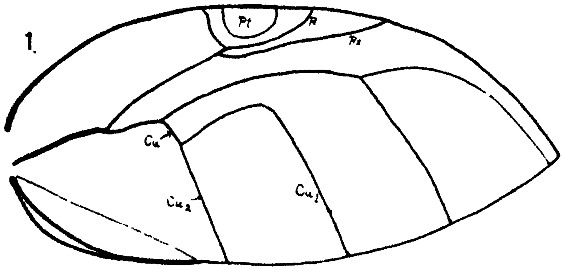
Vertex broad, smooth, strongly deflexed downward, with a slight foveal depression on each side of the median line. Frontal sclerite about half covered by the anterior ocellus and about half visible below the ocellus. Antennae a little longer than width of head between the inner margins of the eyes, but not as long as width of head, including eyes; moderately slender beyond the second segment.

Thorax large and stout, smooth, without pubescence. Metanotum with a pair of small horn-like processes. Forewings hyaline, with a conspicuous black or brown stripe extending along cubitus from medial vein to posterior margin; stem of cubital veins just one-third as long as Cu2.

Abdomen large, with genital segment of female moderately long, but only about half as long as greatest width of forewing.

Described from one female taken on *Ficus* sp. at Keollegal, India, May, 1916, by T. V. Ramakrishna.

1



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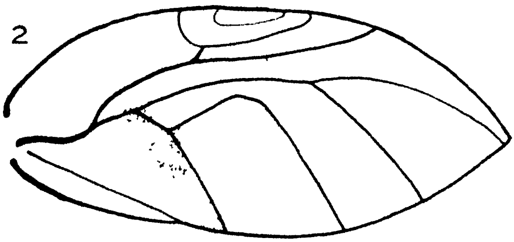

Fig. 1. Forewing of *Macrohomotoma sandakana*. Cu, stem of cubital veins; Cu 1, Cu 2, cubital branches; R, radius; Rs, radial sector; Pt, pterostigma.

Fig. 2. Forewing of *Macrohomotoma striata*.

Maui Insect Notes and Records.

BY O. H. SWEZEY.

(Presented at the meeting of April 3, 1924.)

The following notes are of interest for record, being observations made on a recent inspection trip to the sugar plantations of Maui. Several of the recently introduced insects were found established there for the first time.

Scolia manilae Ashm.

A few were observed in a cane-field at Hana. This is the first record of its being established at the east end of the island.

Casinaria infesta (Cress.).

This was observed at Hana also, it being the first record of this leaf-roller parasite on Maui.

Notogonidea luzonensis Rohwer.

This recently introduced Philippine cricket wasp was observed along irrigation ditch banks in cane-fields at Maui Agricultural Company, Hawaiian Commercial and Sugar Company, and Pioneer Mill Company. It is the first record of its being established on Maui. It has reached the island without assistance, no colonies ever having been distributed there.

Hyperaspis silvestrii Weise.

This little lady-beetle, introduced from Mexico in 1922, was found feeding on the avocado mealy bug on a small tree at the Paia Club House. Several larvae, as well as adults, were observed, indicating it to be well established.

Cyrtorhinus mundulus (Bredd.).

This Australian leaf-hopper egg-sucking bug was found at Maui Agricultural Company, Olowalu Sugar Company, and Pioneer Mill Company. At the other plantations leaf-hoppers were too scarce for the bug to maintain its existence.

Monomorium fossulatum seychellense Emery.

This ant was found at the base of pineapple plants at Haiku. It is an immigrant ant that has only lately come to our attention, occurring in the soil among roots of sugar-cane stools. It has been found on Oahu, Kauai, and Hawaii. This is the first record of it on Maui.

Proterhinus deceptor Perkins

This native beetle was found very abundant on pamakani, its larvae feeding in the dead stems, in Iao Valley and Waikapu Valley. A few *Cis tabidus* Shp. and *Apterocis ephistemoides* Shp. were also found, as well as one or more species of *Oodemas*. The specimens were sent to Dr. Perkins for determination. Pamakani was found to have invaded these two valleys very extensively, blocking up trails and small gulches, and covering steep, rocky slopes where previously there had been very little plant growth except moss, a few ferns, and grass.

It was surprising to find the native insects so common on this weed, especially the *Proterhinus*, as the most of the species have very strict habits as to their hosts among the Hawaiian trees.

Cerotrioza bivittata Crawf.

This small psyllid was found on a *Xylosma* tree in Iao Valley. It has heretofore been known only on Oahu.

Protoparce quinquemaculata blackburni (Butl.).

Four caterpillars of this sphingid moth were obtained from *Nicotiana glauca* bushes growing in waste land near the railroad station at Spreckelsville. This is the one locality where one or more of these caterpillars have been found at each time I have searched there.

Musca vicina Macq.

This fly was reared from maggots found in filter press mud that had been dumped in heaps alongside a plantation railroad at Hana. Maggots were very numerous in these heaps, and some of the flies that issued were the house-fly, but a larger number were the ortalid *Chrysomyza aenea* (Fab.).

The Tomato Hawk-Moth in Hawaii.

BY O. H. SWEZEY.

(Presented at the meeting of May 1, 1924.)

In 1880,* Butler described *Protoparce blackburni* among other Lepidoptera sent him by Blackburn. This sphingid was accompanied by the following note: "Occurs rarely near Honolulu." In his description, Butler compares it with the American species *P. quinquemaculata*, and gives distinctions from it.

In Ann. Mag. Nat. Hist. (5), VII, p. 319, 1881, Butler publishes a description of the larva which Blackburn had sent him. Blackburn notes as to food-plant: "Feeds on a very common weed growing about two feet high, also on a shrub growing some six feet high, neither of which is known to me by name." Very likely these plants were *Datura stramonium* and *Nicotiana glauca* The latter at least is known as its common food-plant at the present time.

In the Fauna Hawaiiensis, Vol. I, p. 193, 1899, Meyrick synonymizes this insect with *Sphinx celeus* Hüb., apparently on examination of a single specimen at the British Museum—one of those collected by Blackburn and described by Butler, as noted above. Evidently, Perkins did not secure a specimen of this moth while collecting for the Fauna Hawaiiensis. He mentions, however, in "The Introduction to Fauna Hawaiiensis," that it "is usually found in the larval state, feeding on the tobacco plant, or on some other of the species of *Solanum*."

In a bulletin ** on "Insect Enemies of Tobacco in Hawaii," Van Dine discusses this insect under the name *Phlegethontius quinquemaculatus* Haw., but gives no particulars as to its distribution in Hawaii, or to what extent it injures tobacco here.

In 1905, I saw caterpillars that had been collected on cultivated tobacco in a mountain valley at Pahala, Hawaii; and in 1919, I was told by Mr. Jared Smith, who was then growing tobacco in Kona, Hawaii, that the caterpillars were often found

Proc. Haw. Ent. Soc., VI, No. 1, August, 1925.

* E. M. M., XVII, p. 6, 1880.

** Bull. 10, Hawaii Agr. Exp. Station, p. 10, 1905.

feeding on tobacco leaves, and that the laborers were always on the lookout for them, to kill any that they found.

The first specimen of the moth that came to my notice was a single specimen in a collection of Lepidoptera sent me for identification by C. W. Cockett, of Lahaina, Maui, in 1916. Several years later, in conversation with Mr. Cockett, I learned that he at one time had reared quite a number of these moths from caterpillars found at Lahaina, but his specimens had all become destroyed.

The first specimen obtained by me was on October 10, 1919, when I found a caterpillar on *Nicotiana glauca* at Kahului, Maui, and reared it to maturity. Again, on December 8, 1922, I found a few caterpillars on the same plant occurring at Spreckelsville, Maui, and reared a couple of specimens. At the latter place, Mr. Kusche, collecting for Mr. B. Preston Clark, in 1919 or 1920, secured several caterpillars, from which a few moths were obtained for Mr. Clark. And now again at this same place, on March 25, 1924, I collected four caterpillars, from which I hope in a few days to have moths appearing.

The specimen of moth I now exhibit was reared by Mr. G. P. Wilder from a caterpillar found by Mr. Krauss feeding on tomato vines and green fruit at the University of Hawaii farm in March of this year. So far as I can learn, this is the first time that the insect has been found on the Island of Oahu since Blackburn collected it before 1880.

The Moth can be considered rare, although its caterpillars are to be found by searching in certain places on Maui. But it must be exceedingly rare on Oahu to have escaped the notice of entomologists all these years since Blackburn's time.

In 1903, in their Revision of the Sphingidae,* Rothschild and Jordan recognize this as a distinct form under the name *Protoparce quinquemaculata blackburni* (Butl.). About the only distinction made is as follows: *P. quinquemaculata.*—"The series of grayish-white post-discal triangular spots of the upper side of the forewings abbreviated costally." *P. quinquemaculata blackburni.*—"The series of white triangular post-discal spots on the upper side of the forewing, extending to the costal margin."

* Nov. Zool., IX, Suppl., p. 72, 1903.

A Review of the Hawaiian Cixiidae, with Descriptions of Species (Homoptera).

BY WALTER M. GIFFARD.

(Presented at meeting of December 4, 1924.)

The superfamily Fulgoroidea is represented by only two families in the native insects of Hawaii—the Cixiidae and the Delphacidae. The Cixiidae are represented by two genera—*Oliarus* and *Iolania*.

OLIARUS Stål.

This genus is represented in Hawaii by fifty-two species and allied forms, in addition to numerous varieties within some of the species. The late G. W. Kirkaldy erected the sub-genus *Nesoliarus* [1] for these, a purely geographical sub-genus retained for convenience.

Muir [2] has recently dealt with this genus and retained Kirkaldy's two sub-genera, but altered the characters upon which one of them is based, viz.:

1. (2) Hawaiian species.................... sub-genus *Nesoliarus* Kirk.
2. (1) Other than Hawaiian species.
3. (4) With two completely divided areolets......*Oliarus* Stål (Typical)
4. (3) With a single complete or only partly divided fossette (without areolets)..........................sub-genus *Nesopompe* Kirk.

This paper deals with the examination and study of accumulated Hawaiian collections, numbering over two thousand specimens made by Perkins, Swezey, Timberlake and others during a period of twenty-eight years. These collections also include material studied, but not named by Kirkaldy, which had been deposited in the Bishop Museum as its share of the "Sandwich Island Committee" collections made by Dr. Perkins in 1892-1901.

Of the seven species described in 1902 in the Fauna Hawaiiensis,[3] three male and three female types are in the British

[1] Proc. Haw. Ent. Soc., II, No. 2, September, 1909, p. 76.

[2] Pan-Pacific Entomologist, Vol. 1, 1925, pp. 106, 107, 161.

[3] Fauna Haw., III, Part II, December, 1902, pp. 120-124.

Museum, and one (a female) in the Cambridge University Museum. All seven types are so marked by Kirkaldy.

From a small amount of material in his hands in 1909, Kirkaldy erected and tabulated,[1] but never fully described, seventeen additional species. The types of three of these are in the Bishop Museum material with their names marked by Kirkaldy in pencil, and fourteen are in the British Museum, represented by either a male or a female selected and marked by Dr. R. C. L. Perkins. These selections by Dr. Perkins were made on the basis of characters given by Kirkaldy in his Table of Species,[2] but none bore the latter's type label nor were any otherwise marked in his handwriting. Altogether there are about thirty-six specimens of both sexes in the British Museum collection, a large number of which bear only a number without any locality label.

The Hawaiian Cixiid material Kirkaldy had for study was comparatively limited in quantity, and many of the species were scarce in individuals. Quite a few were founded on uniques, while some were erected on characters of the female sex alone. Unfortunately, during a protracted illness which culminated in his sad and unexpected death, most of Kirkaldy's personal and other insect material under his control was much neglected, and as a result a large proportion was damaged by insect attack. Furthermore, the Hawaiian material (including the Cixiids) which had been sent to him in England previous to his later residence in Hawaii, when shipped back to him in Honolulu, had been packed in a manner quite unsuitable for a varied and long journey by sea and rail, with the result that large numbers of specimens mounted on cards became loose on the way, injuring not only themselves, but playing havoc with the remainder. His prolonged absence through illness greatly added to the confusion above mentioned and went far to prevent his assembling the material and attaching the names and type labels to most of his new species, thereby making it extremely difficult after his death for Dr. Perkins to select specimens which might represent the species for the British Museum with any great degree of certainty.

[1] Proc. Haw. Ent. Soc., 1909, II, No. 2, pp. 77-80.

[2] Proc. Haw. Ent. Soc., 1909, II, No. 2, p. 77.

The material since collected, together with that left over by Kirkaldy, was large enough to assist in the study of variations in both structure and color. For a similar reason it has been, in a measure, possible to compare and judge of the insular varieties of certain of the commoner species, to separate these where necessary in order to save future confusion and to study characters of the male aedeagus when required for a confirmation of the determinations. The extreme sexual and other dimorphism involved, the similarity in structure, the uncertainties of some characters which have been extensively and satisfactorily used elsewhere, together with apparent drifts by certain transitions from one species or form to that of another, may at some later time necessitate closer study of more material and of larger series of some species than have so far been collected. As Dr. Perkins has most aptly stated,[1] "The separation of the numerous species is attended with considerable difficulty, very few apparently being notably distinct from their nearest congeners." The result of the present studies should, however, be of much assistance in the discrimination of our species and their allied insular forms, and to a very great extent also prevent further confusion in determinations because of the dimorphism and variability above referred to. While it has been convenient—in fact necessary under existing conditions—to give names to certain insular forms of one or more of the species, it is recognized that some of these would have no specific value elsewhere where characters are found to be more constant and reliable. These named forms, however, will be of local assistance, not only in determining, but also in tracing the drifts in transition from one true species to another.

The fairly large amount of material studied has been arranged into five divisions, *viz.*: A, B, C, D, and E. Division A consists of two species; B of eight species, one of which (*discrepans*) may not be endemic; C of nine species, included in which is the common *kaonohi* and three closely related island forms; D (an intermediate division) of five species, all of which appear to be drifting more or less into Division E, which contains twenty-eight species. In the latter division are included several groups,

[1] Fauna Haw., Introduction, Vol. I, Part VI, pp. ccv (1913).

viz.: the *hevaheva* and *kanakanus* groups, each of six closely allied island forms; the *opuna* group of four island forms, and the common *inaequalis* group of four very closely related island forms. In all the divisions there are undoubtedly representatives of more groups, but until closer collecting is done and much more material of these than we now have can be studied, it were well to refrain from summarizing such.

Of the fifty-two species dealt with in this paper, all but six of Kirkaldy's have been redescribed, and of these six, three were erected from single male and three from single female specimens. In many instances Kirkaldy appears to have generally preferred females for his types because the tegmina were, as a rule, more ornamented than those of the males. Many such females were uniques, and as the males of these were very liable to be quite devoid of any ornamentation whatsoever, it was not always possible to discriminate between the sexes unless both were taken together "in situ." The variability in structural characters previously referred to tends to further complicate such instances as these. With the possibility of such sexual differences, the erection of species on the characters of the female sex alone (particularly in the maculate and semi-maculate forms) should be precluded unless obvious reasons are presented for doing otherwise.

The author has based his specific work upon what he considered the most reliable characters for use with this homogeneous race, as follows: (1) The structure of the vertex, including the fossette; (2) the structure of the frons, particularly at base; (3) the general appearance of the genae, particularly when abnormally lengthened or shortened between the anterior margins of the eyes and fossette, when viewed in profile; (4) the color and pattern of the tegmina, the color of the tegminal veins and of the wings; (5) the color of the mesonotum and mesonotal keels particularly, and to a lesser degree the color of other body structures; (6) the form and structure of the aedeagus. Another character in a few of the species has been the fore tibiae where these were much shorter than normal. The material studied, however, has not been sufficient to determine whether this particular character remains constant in the species.

In the material studied the extreme poverty of individuals

in some of the species (more particularly in the maculate forms), and occasional excessive variability in structure, pattern, and coloring of others of which there was a larger assemblage, caused the author more or less difficulty in discriminating between that which was of specific or merely of varietal value. The classification of all the material into divisions appeared to be the only systematic method by which species and forms could be differentiated with reasonable certainty. For this purpose the author has used the structure of the fossette of vertex, more particularly as to whether it was or was not divided by a median longitudinal carina. If divided, it formed two areolets which, depending on surrounding tumescence, were either sub-ovate or sub-quadrate in shape. If not divided, or else incompletely divided, these areolets were absent and the fossette was complete.

Divisions A, B, and C have the fossette completely divided by a median longitudinal carina, the anterior portion of which in some of the species is more or less very slightly, minutely and obscurely annulate or else forked. In Division A the areolets formed on either side of the median carina are acutely angulate. In Division B the area within the fossette is largely swollen, so that the areolets appear small, sub-ovate, and the apical carinae of vertex more or less obscure because of surrounding tumescence. In Division C this tumescent area is much modified, so that the areolets become larger and subquadrate in shape. Division D represents a single group of very closely related species or island forms which are apparently drifting into the following division (E) because in some examples the presence or absence of the median longitudinal carina is inconstant within the species. In Division E the carina of the fossette is either quite incomplete or altogether absent. If incomplete the carina, in some examples, terminates near middle. In most examples, however, the median carina of the fossette is altogether absent or else rudimentary, or perhaps only represented by a swelling of the structure posteriorly. In all the divisions there are species where tumescence at the anterior margins of the fossette gives that structure a more or less quadrate-rotundate appearance. This fact may occasionally cause a wrong interpretation of the apical carinae of vertex, particularly in species which have the angles at base of frons swollen or tumescent, so that these carinae are practically lost in the surrounding tumescence.

With perhaps the exception of *tamehamcha*, all the species have the base of fork of the medio-frontal carina and the anterior margin of fossette coalescent or else the former is a trifle produced into the latter structure, thereby dividing the apex of vertex into "carinae." For that reason the author has pleuralized the term throughout the descriptions.

The transverse, the apical, and the lateral carinae of the vertex are of assistance in making determinations, but cannot always be relied on without reference to other structures.

The structure of the genae (when viewed in profile) and the length of the fore tibiae occasionally deviate from normal, and these characters have been found useful in a few of the species.

The color and pattern of the tegmina and tegminal veins have been used where possible as these characters, although variable within the species, can be relied on to a more or less extent in most forms Among immaculate species there are, however, instances (especially with the females) where extreme variation is represented by forms having the tegmina more highly colored or more or less banded or maculate. In such cases it is most difficult to correctly discriminate the species unless both males and females are collected together "in situ." The coloration of the tegminal veins is an important character and of much assistance. The sexual dimorphism in this latter respect, however, is just as great as it is in the color and pattern of the tegmina.

In some of the species the color of the apical third of the wings is a very serviceable character, and the same may be said of the color of the mesonotum and mesonotal keels, all of which in most of the species are fairly constant. The size and shape of the yellowish macula at the lateral margins of the frons near the clypeal suture also assists materially when discriminating between some of the species. In some of the latter this macula is obsolete or, at most, very obscure.

The position of the tegminal veins and the structure of the legs (excepting the fore tibiae in one or two instances) have not been used in the descriptions. These characters are highly variable in the Hawaiian forms and quite unreliable for specific purposes. Elsewhere, specific value has been given to the position and number of spines on the hind tibiae, but in the Hawaiian forms there are hardly two specimens alike in this respect. The

position of these spines is very variable, the number also varying from one to three within the species. Instances have been found with one of the hind tibiae having either one or two fully developed spines and the other with none at all. Two or more minute or rudimentary spines (visible with strong lens) at extreme base of the hind tibiae appear, however, to be present in a large number of examples studied.

For obvious reasons the genitalia "in situ" are of little or no service in discriminating between the species. Even if dissected out, the pygofer, anal segment and genital styles add but little assistance, as these structures are much alike in all the species, and whatever differences are found are too slight to be of specific value. On the other hand, the aedeagus, when dissected out and examined under the binocular, presents features which are of great service, and it may be used to advantage not only in confirming a determination, but also in detecting a new species. The general structure is tubular, consisting in great part of membrane fused with the more or less chitinized walls of the periandrium and phallus. The apodeme of the phallus enters the tube at the base of the periandrium and continues to the conjunctiva The ejaculatory duct appears to pass within or through the apodeme into the phallus, but it is quite possible that the apodeme may either be a chitinization of the ejaculatory duct or it may have some more obscure origin.[1] This question has yet to be elucidated. While the structure of the aedeagus of our Hawaiian *Oliarus* is somewhat perplexing, it is not nearly so complex as in the species found elsewhere, where both the periandrium and phallus are at most times surrounded with innumerable processes and spines, some of which are of specific importance because of their greater constancy in structural outline. In over two hundred dissections of examples in our own species studied by the author, there was found to be a great similarity in the general appearance of these, excepting the two species included in Division A, the most of those in Division D, and the *opuna* and *kaonohi* groups in Division E.

Generally speaking, the more important characters of the aedeagus in our Hawaiian forms are to be found (when viewed

[1] Muir, 1924, Phil. Jour. Sci., Vol. 24 (5), p. 511.

dorsally) in the apical third of the periandrium and in the shape and size of the spurs or processes at the base, middle or apex of the phallus. These latter generally consist of one spur or process of variable size at the base of the left dorsal margin, a much larger and stouter one at the middle of the right margin, and two of variable length at or near apex. The length, size and position of these when present, or the absence of one or the other, are of specific importance. The species placed in Division A revealed a lengthened and more or less membraneous basal process in lieu of the shorter "spur-like" appendage seen in all others studied. Most of the species in Division D, as well as the *inaequalis* group in Division E, are without spurs at all, basally or apically. In these, however, the right median spur is large and tusk-like. Intermediate forms, however, are to be found in Divisions C and E, in which the basal and apical spurs are more or less rudimentary, confirming the author's conclusion that some of the species in Division C and D are gradually drifting by certain transitions into species which come under Division E. In the *opuna* (E) group the phallus has an additional stout spur on the left margin at middle which has not been found in any other species. The ventral view of the aedeagus is of little interest structurally, except for the presence or absence of a blunt tooth-like process near middle or at basal third of the periandrium. This particular structure is best viewed laterally.

The similarity of structure of the species of Hawaiian *Oliarus*, especially the male genitalia, shows their close relationship to one another. That they have arisen from a single introduction, is the logical conclusion to draw. The line of evolution is apparently one of degeneration of such characters as the carinae of the vertex from the world-wide typical form with two complete areolets, through the incompletely divided to the single undivided fossette. All the New Zealand species of *Oliarus* have the undivided fossette and are closely related to one another, but apparently they are not related to the Hawaiian species. There is one species in Fiji, one in China, and a few in the Malays with the undivided fossette, but they are not closely related to our species or to one another. It would, therefore, appear as if this line of evolution has taken place independently in several

groups of the species of *Oliarus,* and, therefore, it would be illogical to place ours into a genus by themselves, even if the connecting forms did not prevent this. Isolation appears to have played an important part in the evolution of these endemic forms, as it has done in so many of the Hawaiian insects; the fact that they are good flyers may account for the ill-defined characters of many of the species, as the isolation would not be as complete as in such insects as the Delphacidae, where most of the species are entirely or nearly entirely brachypterous. The male of *O. tarai* has been taken "in copula" with the female of *O. neomorai,* which indicates how closely related the "species" are, and also may account for some other connecting forms. We know very little about the life history of the Hawaiian *Oliarus,* and the difficulty of breeding and rearing them under our local conditions makes any genetic work very difficult.

With very few exceptions, all dissections made of the genitalia have been mounted in Canada Balsam card-cells, which are attached to the pin holding the insect. Such as were not so mounted are attached to the card point.

Due to the nature of the structure on the ventral side of the periandrium, it has been found most difficult to mount the aedeagus in the strictly dorsal position, from which the characters are best studied. The chitinized tooth-like attachment on the ventral margin, previously referred to, has tended to tilt the example to one side or the other. This tilting, when it occurs, is most always to the right, because of the overhanging phallus, which gives additional weight to that side. It is, therefore, essential to study the characters of the aedeagus under the binocular while it is still in water, and to make any necessary drawings at that time and before the specimen has been further prepared for its final mount in balsam. In a few instances the thin membraneous nature of the apical third of the periandrium and of the phallus, when placed in alcohol to harden, has caused them to shrink, thereby distorting these characters.

In discriminating between the characters which represent each of the Divisions, a reasonable latitude should be allowed for variability. This also applies to other structures and to color when determining the species, as well as to certain of the charac-

ters outlined in the aedeagus, which may appear different when tilted slightly to the right or left from the true dorsal position.

The table of *Oliarus* species has been made purely for convenience. While it should be of great assistance, it must not be relied upon for the differentiation of species; resort must be had to the descriptions and to the remarks. The table separates some species by islands, and in such cases the descriptions and remarks must be studied. The genitalia have not been used in the table, but wherever possible external characters common to both sexes have been used.

The terminology used is, in most part, that employed by Muir and Kirkaldy. (See Plate II, figs. 14, 15, and 16.)

Medium power magnification by means of the binocular has been used for the study of the various structures referred to in all the descriptions, except where otherwise mentioned (e. g., in *Iolania*).

The types, paratypes and other specimens included in the descriptions have been, for the present, placed in the custody of the Hawaiian Entomological Society. Later they will form part of the collections of the Bishop Museum.

The figures submitted herewith were all drawn by the author, and for these, as well as all dissections and descriptions, he alone is responsible.

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and furnish the author with data in reference to type and other material of the Hawaiian Cixiidae in the British Museum. These data have in many ways proved invaluable, as up to that time no authoritative record was available here concerning the Kirkaldy type or other material in that institution.

Genus OLIARUS Stål.

TABLE OF HAWAIIAN SPECIES *

1\. (42) Fossette of vertex completely divided by a median longitudinal carina, forming two areolets.

2\. (5) Areolets acutely angulate posteriorly, much longer at sides than at middle.

DIVISION A (pp. 66-67).

3\. (4) Vertex wide, tegmina clear hyaline. KAUAI.........1. *muiri*

4\. (3) Vertex narrow, tegmina milky hyaline. KAUAI.....2. *swezeyi*

5\. (2) Areolets much more obtusely angular posteriorly, length at sides not much greater than in the middle.

6\. (23) Areolets sub-ovate, either base of frons or else edges of areolets (or both) more or less tumescent in great measure obscuring apical carinae of vertex, excavate area small.

DIVISION B (pp. 68-80).

7\. (10) Vertex wide.

8\. (9) Tegmina milky hyaline; costa particolored; disc of vertex very shallowly excavate. OAHU. Length 4.5 mm...10. *discrepans* ♀

9\. (8) Tegmina clear hyaline; costa unicolored; disc of vertex deeply excavate. OAHU. Length ♂ 6.75 to 7 mm.; ♀ 7.75 mm. ....9. *kirkaldyi*

10\. (7) Vertex narrow.

11\. (12) Costa particolored. OAHU. Length ♂ 6 to 7 mm.; ♀ 7 to 8 mm..3. *kaiulani*

12\. (11) Costa unicolored.

13\. (18) Tegminal veins particolored.

14\. (15) Mesonotum pale castaneous. OAHU. Length ♂ 6 mm.; ♀ 7 mm.................. { 8. *kaumuahona* / 7. *waiupensis* ♀ }

15\. (14) Mesonotum dark castaneous.

* Lengths are taken from apex of vertex to apex of closed tegmina. Unless otherwise specified, this table is based on male characters, but female characters opposite to those of the males have been noted where possible.

16. (17) Cross-veins seldom suffused; tegmina clear hyaline or not as distinctly milky, often maculate.
   a. HAWAII. Length 7 to 8 mm. . . . . .5. *koanoa* ♀
   b. Males always immaculate; tegminal veins occasionally streaked fuscous. . . . . .5. *koanoa* ♂
17. (16) Cross-veins always suffused, tegmina milky hyaline; males immaculate; females, maculate. OAHU. Length ♂ 4.5 to 5.25 mm.; ♀ 6 mm. . . . . .6. *myoporicola*
18. (13) Tegminal veins not particolored.
19. (20) Tegminal veins dark; tegmina cloudy or bronzy hyaline, immaculate. OAHU. Length ♂ 6.75 to 7 mm.; ♀ 7.5 to 8 mm. (Female with tegminal veins particolored). . . . . . .4. *tantalus*
20. (19) Tegminal veins paler.
21. (22) Small species; OAHU. Length ♂ 4.5 to 5.5 mm. and ♀ proportional. Tegmina clear hyaline, immaculate. . . . . .7. *wailupensis* ♂ ♀
22. (21) Larger species. HAWAII. Length ♂ 6 to 7 mm. and ♀ proportional. Tegmina ♂ clear hyaline, immaculate; ♀ often maculate. . . . . .5. *koanoa* ♂ ♀
23. (6) Areolets sub-quadrate; base of frons and carinae not tumescent or but slightly so; excavate area larger.

Division C (pp. 81-94).

24. (25) Basal and apical third of tegmina darkly fuliginous, middle third clear or milky hyaline. OAHU. Length ♂ 5 to 5.5 mm. . . . . 22. *neotarai*
25. (24) Tegmina not so colored, not divided into three color areas, generally much longer.
26. (37) Tegmina clear or else milky hyaline; males and females.
27. (30) Mesonotal carinae dark.
28. (29) Kauai species. Male. Tegmina immaculate. Female maculate. Length ♂ 7 mm.; ♀ 8 mm. . . . . .12. *nubigenus*
29. (28) Hawaii species. . . . . .16. *filicicola*
30. (27) Mesonotal carinae pale.
30a. (32a) Hawaii and Kauai species.
31. (32) Kauai species. Male. Tegmina immaculate; female maculate. Length 10.5 to 11 mm. . . . . .11. *tamehameha*
32. (31) Hawaii species. Male and female immaculate. Length ♂ 5 to 6.5; ♀ 7 to 7.25 mm. . . . . .16. *filicicola*
32a. (30a) Oahu and Maui species.
33. (34) Cross-veins distinctly suffused. OAHU. Length ♂ 5.25 mm. . . . . 14. *makaala*
34. (33) Cross-veins not suffused, or only slightly so.
35. (36) Larger species. Male, tegmina immaculate; female, tegmina maculate; particoloration of veins lighter. OAHU and MAUI. Length ♂ 6.5 to 7.5 mm; ♀ 7 to 9 mm. . . . . .13. *pele*

36. (35) Smaller species; particoloration of veins darker. OAHU. Length ♂ 5.5 to 6 mm.; ♀ 7 mm. .... 15. *likelike*

37. (26) Tegmina of males yellowish, ochraceous, or tawny hyaline; females with tegmina darker yellowish to fuliginous, immaculate. Length ♂ 5 to 6 mm.; ♀ 6.5 to 7.5 mm.

38. Oahu species. Mesonotum pale or dark castaneous...17. *kaonohi*

39. Lanai species. Mesonotum flavous to dark castaneous..18. *koele*

40. Maui species. Mesonotum flavous to fusco-piceus...19. *halehaku*

41. Hawaii species. Mesonotum flavous to dark castaneous .... 16. *filicicola*

42. (1) Fossette of vertex either not divided or else incompletely divided by a median longitudinal carina.

43. (54) Fossette incompletely divided, the basal portion of the dividing carina more or less evident, but never reaching the apical carinae of vertex.

Division D (pp. 95-103).

44. (51) Tegminal veins dark.

45. (48) Tegmina with basal and apical thirds darkly fuliginous, middle third clear or milky hyaline.

46. (47) Small species. OAHU. Length ♂ 5 to 5.5 mm.; ♀ 6 to 6.5 mm. .... 22. *neotarai*

47. (46) Larger species. HAWAII and OAHU. Length ♂ 6.5 to 7.25 mm.; ♀ 7.5 to 8 mm. .... 21. *tarai*

48. (45) Tegmina not so colored, not divided into three color areas.

49. (50) Tegmina entirely dark fuliginous, opaque.

a. MOLOKAI species; length ♂ 7.25 to 7.75; ♀ 8.5 to 9 mm. .... 23. *morai*

b. KAUAI species; length ♀ 8 mm. (color var.) .... 20. *immaculatus* ♀

50. (49) Tegmina yellowish or tawny, with apical third more or less fuliginous .... 24. *neomorai* ♀

51. (44) Tegminal veins pale.

52. (53) Base of fork of medio-frontal carina open (obsolete); tegmina immaculately dark yellowish, semi opaque. KAUAI. Length ♂ 7 mm.; ♀ 8 mm. .... 20. *immaculatus* ♂ ♀

53. (52) Base of fork of medio-frontal carina closed; tegmina yellowish or tawny hyaline, with apical third more or less fuliginous. ON ALL ISLANDS. Length ♂ 7.5 mm.; ♀ 9 mm. .... 24. *neomorai* ♂ ♀

54. (43) Fossette of vertex entirely undivided or only with a rudimentary basal portion of the dividing carina.

Division E (pp. 104-146).

55. (68) Costa notably thickened at base and in some notably arched.

56. (59) Costa notably thickened at base (less than in *hevaheva*), but not notably arched.

57. (58) Tegmina milky hyaline; wings hyaline; costa not so thick at base as in some other species; tegminal veins very dark. HAWAII. Length ♂ 6.5 to 7 mm. (immaculate); ♀ 7.5 to 7.75 mm. (maculate) ....44. *niger*

58. (57) Tegmina dark yellowish or tawny hyaline, maculate; wings apically fuliginous. MAUI. Length ♂ 9.25 mm. ..29. *haleakalae*

59. (56) Costa notably thickened and notably arched.

60. (64) Mesonotal carinae black or dark castaneous.

61. Lanai species. Tegmina maculate. Length ♂ 8.5 mm. ....26. *lanaiensis*

62. Oahu species. Tegmina maculate. Length ♂ 8 to 9 mm.; ♀ 10 to 11 mm. ....27. *olympus*

62a. Hawaii species. Tegmina maculate...............25. *hevaheva*

63. Kauai species. Tegmina maculate (costa less arched than in *hevaheva*). Length ♂ 7 mm.; ♀ 9 mm.......30. *montanus*

64. (60) Mesonotal carinae palish castaneous.

65. Hawaii species. Tegmina maculate. Length ♂ 8 to 9 mm.; ♀ 10 to 11 mm. ....25. *hevaheva*

66. Oahu species. Tegmina maculate.................27. *olympus*

67. Maui species. Tegmina immaculate; tegminal veins pale. Length ♂ 9 mm. ....28. *mauiensis*

68. (55) Costa not notably thickened nor notably arched at base.

69. (78) Tegminal veins particolored. Large species; length 7 to 12 mm. (including females).

70. Hawaii species. Tegmina maculate. Length ♂ 8 to 8.75 mm.; female 10 mm. ....31. *kanakanus*

71. Oahu species. Tegmina more or less maculate. Length ♂ 7 to 8 mm.; ♀ 9 to 10 mm. ....34. *kaohinani*

72. (75) Kauai species.

73. (74) Apical carinae of vertex distinct. Length ♂ 7 mm.; ♀ 9 mm. .... *consimilis*

74. (73) Apical carinae of vertex indistinct, confluent with tumescent area at base of frons. Length ♂ 8 mm.; ♀ 10 mm........ .... 35. *intermedius*

75. (72) Maui and Molokai species.

76. (77) Fossette of vertex a little longer than wide; base of fork of median frontal carina closed. MAUI and MOLOKAI. Length 8 mm. ....32. *kahavalu*

77. (76) Fossette of vertex a little wider than long; base of fork of median frontal carina open. MAUI. Length ♂ 10 mm.; ♀ 11.5 to 12 mm...........................33. *kulanus*

78\. (69) Tegminal veins not particolored. Smaller species; length of males seldom more than 7 mm.

79\. (90) Tegmina maculate (faintly so in some).

80\. (85) Mesonotal carinae dark.

81\. (82) Basal two-thirds of tegminal veins uniformly pale; darkly fuliginous over apical third of tegmina. KAUAI. Length ♂ 6.5 mm.; ♀ 7 mm. .... 39. *lihue*

82\. (81) Basal two-thirds of tegminal veins dark and pale, but not particolored; not darkly fuliginous over apical third of tegmina.

83\. (84) Vertex wider and tegmina broader and less elongate. KAUAI. Length ♂ 6 mm.; ♀ 6.5 mm. .... 38. *waialeale*

84\. (83) Vertex narrower and tegmina not so broad and more elongate. KAUAI. Length ♂ 5.5 mm.; ♀ 6 mm. ...... 37. *kauaiensis*

85\. (80) Mesonotal carinae pale.

86\. Hawaii species. Vertex wide; tegmina clear to milky hyaline, granules very distinct. Length ♂ 5 to 6 mm.; ♀ 6.25 mm. .... 40. *opuna*

87\. Maui species. Tegmina milky hyaline, veins paler. Length ♂ 5 to 5.5 mm.; ♀ 6 to 6.5 mm. .... 41. *euphorbiae*

88\. Oahu species. Length ♂ 4.75 mm.; ♀ 5.75 to 6 mm. . 42. *acaciae*

89\. Kauai species. Tegmina clear hyaline. Length ♂ 5.5 mm. .... 43. *koae*

90\. (79) Tegmina immaculate.

91\. (99) Mesonotum dark.

92\. Oahu species. Length ♂ 6 to 7 mm.; ♀ 7 to 8 mm. .... 51. *instabilis* *

93\. Hawaii species. Length ♂ 6 to 7.75 mm.; ♀ 7 to 8 mm. .... 49. *inaequalis* * / 52. *inconstans* *

94\. Maui and Lanai species. Length ♂ 6.25 to 7.5 mm.; ♀ 7.5 to 8 mm. .... 50. *similis* *

95\. (96) Mesonotal carinae pale; tegmina and wings very milky white. OAHU. Length ♂ 5.5 to 5.75 mm. .... 48. *albatus*

96\. (95) Mesonotal carinae darker; tegmina and wings otherwise colored.

97\. (98) Yellowish macula at lateral margins of frons near clypeal suture distinct and elongate; tegmina hyaline; veins dark. KAUI. Length ♂ 7 mm.; ♀ 7.75 to 8 mm. .... 45. *silvestris*

98\. (97) Yellowish macula near clypeal suture either obsolete or very indistinct; tegmina yellowish hyaline; veins pallid. LANAI. Length ♂ 6 mm. .... 47. *agnatus*

99\. (91) Mesonotum pale. Tegmina broad; veins lightly particolored and medianly pallid. KAUAI. Length ♂ 5.25 mm. .... 46. *halemanu*

* With perhaps the exception of *inconstans*, all males in this group species have the tegmina immaculate and without particolored veins. On the contrary, the females of all four species, including *inconstans*, have examples with maculate as well as immaculate tegmina and with or without particolored veins.

Description of Species.

Division A.

Fossette of vertex completely divided by a median longitudinal carina forming two areolets. Areolets acutely angulate posteriorly, much longer at sides than in middle. (See Plate I, Fig. 7.)

1. **Oliarus muiri** sp. nov. Plate II, Figs. 19, 20, 21.

Male. Length, 5.25 mm.

Width of vertex at base one and three-tenths times the width at apex; width at apex equal to the width at origin of transverse carina; length one and eight-tenths times the width at base; carinae of apex curved; transverse carina (at origin) about one-third from apex, angulate, straightly converging from point of origin; fossette acutely angulate posteriorly, two and one-tenth times longer at the side margins than at the middle, completely divided into acuminately excavate areolets by a median longitudinal carina.

Frons and clypeus very moderately excavate, surfaces more or less wrinkled; basal angles of frons more or less tumescent; fork of mediofrontal carina narrow, elongate, the base level with apex of vertex; frontoclypeal suture and median ocellus faintly visible. Fore tibiae of moderate length.

Tegmina hyaline, diffused light yellowish fuliginous immaculate; tegminal veins on the basal two-thirds fuscous more or less interrupted with whitish markings (particolored); apical one-third fuscous; commissure fusco-piceus; stigma light fuscous (in part); granules pale and dark, distinct. Wings hyaline, veins fuscous.

Mesonotum, vertex, frons and tegulae fuscous; mesonotal carinae castaneous; pronotum immaculately pale stramineous; carinae of vertex and frons (in part) light fuscous; inter-lateral margins of vertex widely stramineous; macula at lateral margins near fronto-clypeal suture, sordid yellow, distinct; legs testaceous and abdomen fusco-piceus.

Aedeagus with the periandrium apparently of normal length; apical half of the apodeme of the phallus, together with surrounding membrane, unusually prolonged; phallus more than twice the length of the periandrium, armed basally with a long membraneous process, medianly at right with a stout curved spur and apically with only one spur (the right) which is stout and well developed. In profile the ventral margin of the periandrium is not armed with either tooth or spine. Pygofer setigerous, the setae or hairs unusually long, when viewed in profile, along the lateral margins. Genital styles and anal segment of the same character as in all Hawaiian species.

Hab. Mountain regions of Kauai. Described from a single male (the type), labeled Alakai Swamp, August 22, 1921 (Swezey).

Obs. This unique species and the one following (*swezeyi*) are evidently the closest relatives, so far known, of the ancestral form from which all the Hawaiian species have descended. The structure of the vertex, particularly, presents the strongest evidence that it is congeneric with the genotype *Oliarus walkeri* Stål. (See Plate II, Fig. 17.) The aedeagus of this and the following species (*swezeyi*) is quite unlike that of any other Hawaiian forms.

I have named this species after Mr. Fred Muir, without whose assistance and co-operation his co-workers would have had much difficulty in the discrimination of many of our Hawaiian species of Homopterous insects.

2. **Oliarus swezeyi** sp. nov. Plate I, Fig 7; Plate II, Figs. 15, 22, 23, 24, 25, 26.

Male. Length, 5.5 mm.

Width at apex of vertex about the same as the width at base and at origin of transverse carina; length three times the width at base; carinae of apex curved; transverse carina (at origin) about one-third from apex, angulate, roundly converging from point of origin; fossette similar to that of *muiri*, excepting that the median longitudinal carina is apparently longer than in that species.

Frons and clypeus same as *muiri*, but with the surfaces smooth (not wrinkled).

Tegmina milky hyaline, immaculate; tegminal veins on basal two-thirds diluted pale and dark (particoloration little apparent) with the apical one-third, the stigma, costa and commissure all dark fuscous; cross-veins within the apical margin suffused; granules dark and distinct. Wings milky hyaline, veins fuscous.

Piceus; pronotum and tegulae sordid fuscous, margins stramineous; carinae of vertex and frons, in part, fulvous; the flavid macula at lateral margins near fronto-clypeal suture distinct, attenuated basad; legs fusco-testaceous more or less longitudinally striped stramineous

Aedeagus with the periandrium and the armature of the phallus quite unlike those of *muiri;* the process at the base of the phallus is also more sinuous and much shorter than in the latter species; pygofer comparatively small and the anal segment longish. The long hairs, which are present at

the lateral margins of the pygofer of *muiri*, are quite absent in the single example studied.

Hab. Island of Kauai. Described from one male (the type), labeled Olokele Canyon, September 5, 1920 (Swezey).

Obs. Aside from the structure of the aedeagus, the male of this species is easily separated from *muiri* by the much narrower width at the base of vertex, the longer median carina of the fossette, the roundly converging transverse carina, the apparently shorter pronotum, and the color and pattern of the tegmina.

In the material before me there is one female specimen from a nearby locality on Kauai which is closely associated with this species mainly because of the similarity in the structure of the vertex and in the appearance of the tegmina superficially. The example, however, appears to be too small (only 5 mm. long) and not altogether what one might expect in order to make a positive determination. Until the mountains of Kauai have been closely collected for more material, I consider it best to place this female here temporarily. Frons and mesonotum (in part) fusco-piceus, mesonotal keels fulvous with a spot of like color at basal angles; carinae of vertex and frons fulvous. Tegmina hyaline, immaculate; tegminal veins on basal two-thirds all pale except for remote dark particolorations on the Sc and Cl 1 + 2; veins on apical one-third more or less fuscous, and cross veins within the apical margin more or less suffused. One female labeled Waimea Canyon, September 4, 1921 (Swezey).

I have named this species after Mr. O. H. Swezey, to whom we are so much indebted for the larger proportion of the material before me, without which it would not have been possible to present this slight contribution to our knowledge of the Hawaiian Cixiidae.

Division B.

Fossette of vertex completely divided by a median longitudinal carina forming sub-ovate areolets. Areolets much more obtusely angular posteriorly than in Division A. Length at sides not much longer than in the middle. Base of frons or else edges of areolets (or both) more or less tumescent and in great

*measure obscuring apical carinae of vertex.** *Excavate area small.* (See Plate I, Figs. 1 and 2.)

3. **Oliarus kaiulani** sp. nov. (MS. name Kirk.). Plate III, Figs. 27, 28, 29, 30.

Male. Length, 6 to 7 mm.

Width of vertex at base one and two-tenths to one and four-tenths times the width at apex; width at apex equal to the width at origin of transverse carina; length two and one-tenth to two and four-tenths times the width at base; carinae of apex curved; transverse carina (at origin) about one-fourth from apex, sub-angulate, more or less roundly converging from point of origin; fossette angulate posteriorly, one and one-tenth times longer at the side margins than at the middle, completely divided into subovate (more or less acuminately excavate) areolets by a median longitudinal carina, the anterior portion of which is minutely annulate.

Frons and clypeus very moderately excavate; basal angles of frons largely tumescent—level with apical carinae of vertex; fork of mediofrontal carina short, more or less narrow, with the base on a level with apex of vertex.

Tegmina hyaline, immaculate, basal third banded, middle diffusedly spotted and all the apical third, more or less yellowish fuliginous; tegminal veins on basal two-thirds (including costa) distinctly particolored whitish or yellowish and dark fuscous, with those on the apical third all of the latter color; stigma fuscous, dilute basally. Wings hyaline, veins light to dark fuscous.

Mesonotum, keels and tegulae fusco-piceus; hind margins of mesonotum (in most examples) narrowly and irregularly fulvous; pronotum (except for a small part of the lateral area) almost immaculately stramineous; inter-lateral margins of vertex, fossette and apical half (medianly) of frons and the clypeus, fusco-piceus; carinae of the vertex narrowly, and of the basal third of frons widely stramineous, the latter color extending along the lateral margins of the frons until it widens out near the clypeal suture; legs flavo testaceous and abdomen fusco-piceus, with dorsal margins fulvous.

Female. Length, 7 to 8 mm.

Structurally the same as the male, excepting that the tumescent area at base of frons is generally more prominent and the vertex a little wider. The pigmentation of the tegmina is slightly variable, many of the examples having these as immaculate as those in the male, while others have faint and remote spots on the apical third. The tegminal veins are more darkly particolored, but otherwise the same as those in the male, excepting

* A number of species in all Divisions have the apical carinae of vertex more or less obscure. In most instances this is caused by a slight tumescent area at base of frons and anterior margins of fossette.

that the darker ones in the clavus are more or less suffused, sometimes giving these the appearance of being spotted. Some examples also have the apex of the apical third more or less particolored.

Types, male and female, labeled Halawa, Oahu, December 17, 1922 (Swezey).

Hab. Oahu Mountains at all elevations from 600 to 4000 feet. Described from eighteen males and twenty-three females collected in numerous localities on all the mountain ranges and slopes between 1900 and 1922: By Perkins, in 1900; Giffard, 1905-6; Swezey, 1908-22; Fullaway, 1909-19; Timberlake, 1916; Williams, 1919; Bryan, 1920, and Ehrhorn, 1910. In addition there are three undetermined females (on card) in the Perkins' collections marked "loc ? either Haw. ? or Molokai ?." These latter are, however, identical with females from Oahu. Notwithstanding the fairly large series in the collections, most of the examples are individual specimens (either male or female) from scattered localities; the only pairs labeled as collected on any one date are from Tantalus (two males and three females, May 16 and November 19, 1905, Giffard); Waiau (one male and one female, March 28, 1920, Bryan), and Halawa (one male and one female, December 17, 1922, Swezey). Only one male (No. 885), Honolulu Mountains, Perkins, November, 1900 (undetermined), was found in the Kirkaldy material.

Obs. In one of the collections before me there are single specimens of this species which at some time in the past were determined under the names of *kaiulani*, *kaohinani*, and *procellaris*. These names, however, are not in Kirkaldy's handwriting, and the only example in his material at the Bishop Museum was the undetermined male previously referred to. The remarks under *kaohinani* in Division E will explain the reason for the name *kaiulani*. The indefinite description of Kirkaldy's *procellaris*, as given by him in his preliminary tables, caused much of the confusion (above referred to) as to that species, the status of which is not improved by the fact that no specimens under that name exist in either of the museums where Kirkaldy's studied material was deposited. Later collectors evidently selected the smaller specimens of what I have named *kaiulani* as the nearest approaching the description of *procellaris*, but the decided dark

and pallid particolorations of the tegminal veins on the basal two-thirds of the former, the diffused pale yellowish fuliginous markings of the tegmina (so often referred to as good characters by Mr. Kirkaldy) and the similarity of structure and coloration in all, regardless of exact size, suggests that none of these were what Kirkaldy intended for his species *procellaris*.

The aedeagus of this species appears very variable, the apical third of the periandrium assuming several shapes, depending in most part, as usual, on the position from which it is viewed by the student. Differences also appear apparent because of the undeveloped membraneous structure of the whole apex of the periandrium, the outline of which was hardly distinguishable in several dissections. On the contrary, however, the phallus (including spurs) and the base of the periandrium were in all instances either fairly well chitinized or covered with well-developed membrane (as the case may be) and by no means variable in shape or size worth mentioning. In the illustrations I have figured two examples of the aedeagus of this species, showing variations in the apical third of the periandrium, but in which the external structures and colorations of each are identical. As a matter of fact, this species presented less variations in external characters than did most others of our endemic forms.

4. **Oliarus tantalus** sp. nov. Plate I. Fig. 1; Plate III. Figs. 32, 33.

Male. Length, 6.75 to 7 mm.

Vertex much the same as in the preceding species, excepting that the apical carinae, when at all distinct and not quite lost in surrounding tumescence, are more or less angulate and not curved, making the areolets of the fossette appear deeper and more acuminate anteriorly and the basal angles of the frons produced posteriorly.

Tegmina cloudy or bronzy hyaline, immaculate; tegminal veins on basal two-thirds either all dark fuscous or else these are shaded (in part) from fuscous into fusco-testaceous, the Cl and Sc apparently oftener of the latter color; veins on apical third and the costa all dark fuscous; granules dark and distinct. Wings hyaline, veins fuscous.

Mesonotum and mesonotal keels piceus; pronotum and tegulae sordid fuscous; vertex, frons, etc., much the same as in the preceding.

Female. Length, 7.5 to 8 mm.

Of much the same color and structurally like the male, excepting that the areolets of the fossette are larger, the hind margins of the mesonotum

are narrowly and irregularly light castaneous and the basal two-thirds of the tegmina are more or less particolored whitish or yellowish and fuscous.

Type male and holotype female, labeled Palolo, December 24, 1922 (Swezey).

Hab. Oahu, on both Koolau ranges, but seldom at the higher elevations. Described from twenty-eight males and twelve females collected by Swezey, Giffard, Fullaway, and Timberlake, in various localities between 1906 and 1922, viz.: Tantalus, Palolo, Maunawili, Punaluu, Kaumuahona, Waiahole, Manoa, Cooke trail and Nuuanu Pali, Olympus and Wahiawa. In the series are several pairs of both sexes, viz.: By Swezey: 2 males and 2 females, Palolo, December 24, 1922; 2 males and 1 female, Manoa, September 5, 1909; 1 male and 1 female, Tantalus, March 29, 1918. By Giffard: 1 male and 1 female, Maunawili, November 9, 1906. By Fullaway and Giffard: 2 males and 1 female, Nuuanu Pali, April 1, 1917. The rest of the series comprises single specimens of either sex taken at various dates.

Obs. Although this species may have many of the same characters as the preceding, it can easily be distinguished from the latter by the difference in the apical carinae of vertex, the color of the tegmina, and particularly the lack of particoloration in the tegminal veins and costa of the male. The material examined demonstrates comparatively little variation in this species. The large ovate areolets of the fossette in this and the preceding species suggests that they have partly drifted into Division C.

5. **Oliarus koanoa** Kirk. Plate I, Fig. 2; Plate III, Figs. 34, 35.

Male. Length, 6 to 7 mm.

Vertex much like in the preceding species, but much more variable in the width at base and in the length from base to apex. The fossette, however, is practically the same in all specimens examined, more or less tumid anteriorly when viewed laterally, the tumescence diminishing to a large extent the size of the acuminately excavated areolets, as well as widening out the median longitudinal carina; the apical carinae are mostly, if not altogether, lost in the tumescent area surrounding the anterior portion of the fossette and the basal angles of frons.

Fork of frons short, narrow, the carinae more or less swollen; basal angles of frons very largely tumescent.

Tegmina immaculate, hyaline, varying in color from more or less milky-white to slightly yellowish; tegminal veins on the basal two-thirds more or

less pallid, sometimes either flavescent or else flavo-testaceous and occasionally remotely streaked light fuscous; veins on the apical third and the costa vary from testaceous to light fuscous, not particolored.

The mesonotum varies in color from fusco-piceus to piceus and the mesonotal carinae from fuscous to castaneous; hind margins of the mesonotum in most examples slightly streaked castaneous; carinae of the vertex, the frons and the pronotum, etc., fulvous or stramineous.

Female. Length, 7 to 8 mm.

Structurally like the male, except for the wider fossette and base of frons which are more largely tumescent. There are as many as five variations in the coloration and pattern of the tegmina, some examples being immaculately hyaline, others sparsely spotted or else both spotted and obliquely and irregularly banded fuscous. Several examples from Kahuku, Kona and Kilauea, Kau, have dark fuscous longitudinal irregular bands extending from clavus to apical margin; tegminal veins on basal two-thirds more or less particolored whitish and fuscous, but there are occasional examples from Kona and other localities which have these particolorations more or less obscure and infrequently quite absent; costa and veins as in the male.

Hab. Island of Hawaii, mostly in the drier regions at moderately high elevations. Redescribed from one hundred and thirty males and eighty-five females as follows: *From the Kirkaldy material in the Bishop Museum:* One male and one female labeled No. 656 (i. e., Kilauea, August, 1896, Perkins), the male marked "koanoa" in Kirkaldy's handwriting; one damaged male, No. 532 (Kilauea, August, 1895); one male, Kona, 4000 feet, July, 1892 (Perkins); 1 damaged male, No. 650 (Perkins); one male, Hualalei (Kona), 5000 feet, August, 1892 (Perkins); one damaged male, Kona, 3000 feet, October, 1892 (Perkins); two females, No. 691 (Kilauea), July, 1895, and one female, Kona, 4000 feet, September, 1892 (Perkins).

From the Perkins private collection, viz.: Six males and four females, Kilauea, 1903-1906; two males and two females (no locality label); one male, Hilo district, 1800 feet (no date) and mounted on cardboard; two males and two females, labeled Blackburn, Hawaii.

From other collections, viz.: Forty-eight males and forty-seven females, Kahuku (a-a flows), on *Maba sandwicensis,* January 15, 1917 (Muir and Giffard); seven males and five females; Kilauea, "4" (no date), G. & M.; four males and two females, Kilauea, June 27, 1917 (Swezey); one male, Kilauea,

July 27, 1920 (Giffard); nine males, four females, dry forest, Kilauea, July 16, 1918 (Giffard); nine males, seven females, Puuwaawaa, North Kona, August 24, 1917; ten males, Kau Road, January 16, 1917; two males, North Kona Road, August 22, 1917; three males and one female, South Kona Road, August 1, 1922; eleven males and three females, Kau-Kona boundary, July 31, 1922 (Giffard); one male, Kona, 2500 feet, April 23, 1916 (Pemberton); four males, two females, South Kona, August, 1919 (Swezey), and same date and locality, five males and two females (Timberlake).

Obs. The type in the British Museum is a male from Kona, Hawaii. In the Kirkaldy material at the Bishop Museum there is a male from Kilauea, Hawaii, tagged *koanoa* in his handwriting. The latter example agrees with all the specimens referred to, excepting as to certain of the color variations noted in the above description. Although Mr. Kirkaldy had a comparatively small series of this species to study, it is quite evident that he was fully aware of its variability, particularly as to the pattern and coloration of the tegmina.* It would be impossible to discriminate between all these variations, because of slight differences in size and color without even larger series of each than those studied, and, so long as the structures of all are alike, it is well to lump them and save confusion. The highly tumescent area surrounding the fossette and base of frons, the very small ovate areolets and the coloration in general will easily separate it from all other species on the Island of Hawaii.

The aedeagus has the apical third of the periandrium as membraneous and apparently as variable as its ally (*tantalus*) from Oahu.

6. **Oliarus myoporicola** sp nov. Plate I, Figs. 12, 13; Plate III, Figs. 37, 38, 44.

Male. Length, 4.5 to 5.25 mm.

Width of vertex at base one and one-tenth to one and two-tenths times the width at apex; width at apex about equal to the width at origin of transverse carina; length two and one-tenth to two and three-tenths times the width at base; carinae of apex obscured because of tumescent area surrounding anterior portion of fossette and base of frons; transverse

* See Remarks—Kirkaldy, 1902, Fauna Haw., III, p. 124.

carina (at origin) approximately one-fifth from apex, sub-angulate; fossette angulate posteriorly, as long at side margins as at middle, completely divided into sub-ovate acuminately excavated areolets by a median longitudinal carina. In lateral view the basal angles of frons, where these join the anterior area of fossette, appear more or less tumid.

Frons and clypeus very moderately excavate; basal angles of frons very largely tumescent, level with apex of vertex; fork of medio-frontal carina short and narrow, the base more or less obscure because of surrounding tumescence.

Tegmina milky hyaline, usually quite immaculate, infrequently sparsely maculate; tegminal veins on basal two-thirds more or less particolored whitish or yellowish and fuscous, sometimes with the darker coloration more or less suffused; color of veins on apical third variable, sometimes all fuscous, but more frequently particolored, as in the basal two-thirds, cross-veins dark fuscous, suffused; costa testaceous, not interrupted with particolorations. Wings hyaline, veins either testaceous or else light fuscous.

Mesonotum fuscous; mesonotal keels light castaneous; pronotum and tegulae sordid stramineous, sometimes sordid testaceous; vertex and frons more or less light fuscous, variable; carinae more or less flavid; macula at lateral margins near fronto-clypeal suture, distinct, wedge-like; legs either stramineous or else testaceous; pygofer more or less, and genital styles most always, sordid stramineous.

Female. Length, 6 mm.

The same as the male structurally and of similar coloration, excepting that the base of frons and the fossette in general are wider, the vertex, frons, clypeus, etc., invariably darker and the tegmina maculate, the latter having one or more fuscous transverse bands and spots on the basal two-thirds with the apical third more or less irregularly and largely spotted of the same color. Tegminal veins basally and apically more or less particolored whitish and fuscous with the cross-veins suffused.

Hab. Oahu, on the low-lying coral plains near the most southwesterly point of the island. Described from twenty-four males and seven females taken at Barber's Point, from *Myoporum sandwicense*, as follows: Two males, June 29, 1919; six males and three females, October 16, 1921; sixteen males and four females, December 23, 1923 (Swezey).

The types, male and female, are from the series dated October 16, 1921.

Obs. There is little variation in the structure of the vertex of this small and interesting species, but the coloration of the frons and the pattern of the tegmina are sometimes deceiving

because of differences in the density of the tegminal particolorations of the veins in the male, and of the size, shape, and number of the maculae in those of the female. Of three dissections made of the genitalia, the aedeagus also presented variations in the apical third of the periandrium, the right dorsal margin of which will be found occasionally more elongate than shown in the figure. In a measure, the character of the vertex, as well as the aedeagus, allies it to *koanoa* of Hawaii (a larger species) and to other small species in the same group from Oahu and other islands.

7. **Oliarus wailupensis** sp. nov. Plate III, Figs. 39, 40.

Male. Length, 5 mm.

Structurally the same as *myoporicola*, excepting as follows: Length of vertex three and one-tenth times the width at base; transverse carina about one-sixth from apex; base between lateral carinae narrower (carinae hardly converging); upper part of the genae between the anterior margins of the eyes and fossette (viewed in profile), longer and the base of fork of medio-frontal carina more distinct.

Tegmina hyaline, broader, immaculate; tegminal veins on basal and apical thirds flavo-testaceous, more or less suffused light fuscous; granules brownish, very distinct. Wings hyaline, veins light fuscous.

Testaceous; mesonotum sordid fuscous; mesonotal keels light castaneous; otherwise the coloration is much like the preceding, except paler; macula at lateral margins near fronto-clypeal suture pallid, more or less diffused. The aedeagus in this species differs but little from others in the same group.

Hab. Oahu, on the Koolau mountain range. Described from a single male (the type) labeled Wailupe, May 6, 1917 (Swezey).

Obs. The somewhat longer vertex, the lengthened distance of the upper part of the genae between the anterior margins of the eyes and of the fossette (when viewed laterally) the broader and non-particolored tegmina will easily distinguish this from other described small species in this group. I have seen no females which I can associate with this species, with any degree of certainty. It may be that some of the smaller-sized female examples which I have placed provisionally with *kaumuahona* are here referable.

8. **Oliarus kaumuahona** sp. nov. Plate III, Figs. 42, 43.

Male. Length, 6 mm.

Closely allied to and structurally like *wailupensis*, but of somewhat larger size and with the tegmina less broad.

Tegmina hyaline, immaculate; tegminal veins on basal two-thirds more or less lightly particolored flavo-testaceous and fuscous, more so obliquely on the middle third; veins on apical third dark fuscous more or less sparsely particolored testaceous.

The coloration is in general much more pallid than in the preceding species, with the mesonotum stramineous largely fused with castaneous, and the mesonotal keels flavid.

Female. Length, 7 mm.

Similar to the male, but brighter in coloration and with tegmina basally and apically more distinctly particolored yellowish and dark fuscous.

Hab. Oahu, on the Koolau mountain range. Described from four males and two females, as follows: Two males and one female, Kaumuahona plateau, June 4, 1916, and one male and one female, same locality, November 17, 1918 (Swezey); one male, Palolo, June 3, 1915 (Fullaway).

Types, male and female, are labeled Kaumuahona, O. H. S., June 4, 1916.

Obs. I have referred seven females of smaller size, but of similar structure and coloration, to this species, but it is quite possible that these, as well as two females of still smaller size, may be associated with *wailupensis*, although the shape and pattern of the tegmina do not warrant any such conclusion. All of these females are from Kaumuahona, excepting one each from Wailupe and Lanihuli, and were collected mostly by Swezey and Timberlake.

9. **Oliarus kirkaldyi** sp. nov. Plate III, Figs. 31, 36, 45, 46, 47, 49.

Male. Length, 6.75 to 7 mm.

Width of vertex at base one and two-tenths times the width at apex; width at apex about equal to the width at origin of transverse carina; length twice the width at base; carinae of apex almost obscured by tumescent area; transverse carina (at origin) about one-fourth from apex, subangulate more or less roundly converging from point of origin; fossette angulate posteriorly, largely tumescent (in profile tumid), completely divided into subovate areolets by a broad and flattened median longitudinal carina.

Frons and clypeus moderately excavate, more or less rugosely punctate with the punctures irregular in size and shape and sparsely distributed; basal angles of frons acutely produced, highly tumescent, almost obscuring base of fork of medio-frontal carina.

Tegmina clear hyaline, immaculate; tegminal veins testaceous shaded down to light fuscous at extreme apex of the apical third; costa ochraceous; stigma on the apical two-thirds fuscous, on basal third pallid; granules dark, very distinct. Wings hyaline, veins testaceous.

Mesonotum particolored (diffused) castaneous and flavo-testaceous with flavid keels; pronotum and tegulae stramineous; inter-lateral area of vertex castaneous; the fossette, all the carinae and the frons stramineous; frons and clypeus stramineous, more or less irregularly and sparsely spotted or mottled fuscous; all the carinae of vertex, the tumescent area of fossette and at base of frons, the pronotum, the tegulae and the legs, stramineous; macula at lateral margins near fronto-clypeal suture, whitish, large, but more or less diffused.

Female. Length, 7 to 7.5 mm.

Somewhat darker than the male in coloration, but structurally the same, except that the fossette of the vertex and the area between the lateral carinae are wider and the frons and clypeus smooth, without the puncturations and partly rugose surface seen in the male. Tegmina from clear to part milky hyaline, immaculate; tegminal veins basally and apically more or less particolored whitish and fuscous; cross-veins suffused, granules much less distinct than in the male, macrotrichia long, light brownish.

Hab. Oahu, at elevations between 2000 and 3000 feet. Described from one male and one female, labeled Waianae, 2400 to 2800 feet elevation, June 1, 1919 (Timberlake); one female, west side Mount Kaala (Waianae), June 1, 1919 (Swezey); two females, Waiahole, June 12, 1921 (Swezey).

The types, male and female, labeled Waianae, June 1, 1919 (Timberlake).

Obs. The wider fossette and base of frons, the highly tumescent area surrounding these structures, and the much greater width between the lateral carinae will easily separate this species from all others in Division B.

The scattered large puncturations and the more or less rugose appearance of the frons and clypeus of the male described may be abnormal and not characteristic in a series. Without further material, these particular characters should not be considered quite dependable.

The aedeagus is not unlike that of all the other species at-

tached to this division, but the example dissected is without the usual spur at the base of the phallus.

I have named this species after my friend, the late G. W. Kirkaldy, whose life work was devoted especially to the study of the Hemiptera, and to whom his fellow-workers in that Order are especially indebted for valuable data relative to the Cixiidae and other Hawaiian endemic forms.

10. **Oliarus discrepans** sp. nov. Plate III, Figs. 41, 48.

Female. Length, 4.5 mm.

Width of vertex at base one and one tenth to one and two-tenths times the width at apex; area between lateral carinae shallow, much wider than the length of an eye; width at apex one and one-tenth times the width at origin of transverse carina; length the same as the width at base; carinae of apex curved; transverse carina (at origin) about one-third from apex, sub-angulate; fossette much wider than long, angulate posteriorly, more or less tumescent, completely divided into acuminately ovate areolets by a broad and flattened median longitudinal carina, the anterior portion of which is annulate; lower portion of genae between the side margin of the eyes and the lateral carinae of frons, very wide; antennae comparatively large, and the eyes small.

Frons and clypeus comparatively short and broad, slightly excavate; basal angles of frons wide and very largely tumescent, the tumescence obscuring to some extent part of the laterals and all the base of the fork of the medio-frontal carina; macula at lateral margins near fronto clypeal suture wedge-shaped, whitish, distinct, very much longer than wide; fore tibiae comparatively short.

Tegmina more or less milky hyaline, immaculate; tegminal veins mostly whitish, except at middle third, where these are more or less suffused and sparingly particolored light fuscous, the suffusion sometimes giving the membrane in the cells the appearance of being very indistinctly maculate; veins at extreme apex and base very faintly particolored (sometimes hardly apparent) and the cross-veins altogether light fuscous; stigma pallid; costa particolored at middle third.

Coloration very variable. Mesonotum dark castaneous, sometimes diffused fulvous with the mesonotal carinae always of the latter color; pronotum and tegulae stramineous; area between lateral carinae of vertex, the areolets of fossette, and the frons and clypeus, mostly castaneous; one example, however, has the frons and a part of the vertex more or less testaceous; carinae of vertex, the genae and the tumescent area at base of frons either stramineous or fulvous; abdomen castaneous, widely margined fulvous; legs pallid.

Hab. Oahu, mostly at the lower elevations, from the coast to 1000 feet. Described from four females as follows: One at

Ewa Mill (on sugar-cane, accidentally) July 14, 1911 (Swezey); one at Manoa, Honolulu ("at light" in residential area), 1912 or 1913 ? (Muir); one at Upper Pauoa Valley Flats (sweeping), May 10, 1919 (Bryan); one on table in the University of Hawaii cafeteria, Manoa, October 11, 1922 (Swezey).

The type selected is the example labeled Ewa Mill, July 14, 1911, collected by O. H. Swezey.

Obs. No male of this rare and unique species has yet been collected. In all, five specimens (all females) have been taken in the thirteen years since the first was collected (accidentally on sugar-cane) at the Ewa Plantation by Mr. Swezey. Only four of these five specimens are included in the list above given, the fifth having by accident "flipped off" the card mount, where it was insecurely fastened. Unfortunately, it was not recovered. This last specimen was one taken at rest on a stone at Makapuu Point * by P. H. Timberlake, January 25, 1920.

The extreme widths of the base of frons, the base of vertex, the shortness of the latter, as compared with the width of the genae between the lateral carinae of frons, and the side margins of the eyes, as well as other features somewhat remote from other typical Hawaiian forms, is the writer's apology for a departure from his rule—not to erect species in this and similar groups from females alone. The characters above referred to permit the possibility that this particular species is of late introduction, but the writer for the present is inclined to the view that the nature and character of the fossette and the very tumescent area surrounding it and also the base of frons, as well as other typically Hawaiian characters associates it, to a more or less extent, with others in this particular division of our endemic species.

The male when collected will probably be found to be of smaller size than the female, with similar structures to the latter except that the fossette, the base of frons, and the area between the lateral carinae of vertex will be less wide and the tegminal veins either without any particolorations or, at most, with very

* On March 11, 1925, Mr. F. X. Williams captured a female of this species on the running-board of his automobile while it was parked on the belt-road near Haleiwa, Waialua, Oahu.

faint ones medianly. The character of the genitalia of the male when discovered will undoubtedly settle the question as to whether the species is endemic or a later introduction. If endemic it is more than likely attached to lowland native grasses or sedges.

DIVISION C.

Fossette of vertex completely divided by a median longitudinal carina forming sub-quadrate areolets. Base of frons and carinae not tumescent as in Division B, or but slightly so. Excavate area larger.* (See Plate I, Fig. 3.)

11. **Oliarus tamehameha** Kirk. Plate I, Fig. 11; Plate IV, Figs. 50, 51.
Fauna Haw., III, Part 2, 1902, pp. 120 and 121.
Proc. Haw. Ent. Soc., II, No. 2, September, 1909, p. 77.

The type in the British Museum is a male specimen marked by Kirkaldy and bearing the number 509 (i. e., Kaholuamano, Kauai, 4000 feet, April, 1895, Perkins Coll.). Accompanying the type are a male and female numbered 409 (i. e., Kauai, high plateau, 4000 feet, July 1896, Perkins Coll.). Of the Kirkaldy material in the Bishop Museum, Honolulu, which was also collected on Kauai by Dr. Perkins, the following have been examined and studied: One male, numbered 509 (Kaholuamano, April, 1895); three males, numbered 648 (Waimea district, 2000 to 3000 feet, January to February, 1897), and three females, numbered 682, 631, and 640, respectively (Kauai, high plateau, July to August, 1896). In this same material there were also two specimens, numbered 682 and 631, with the abdomen off and otherwise damaged. These latter are undoubtedly this species, however. Other collections of more recent date include one male, Kaholuamano, Kauai, 4500 feet, May 8, 1920, and one male and one female from same locality, April, 1920 (Kusche).†

This species, conspicuous because of its size, is apparently confined to the high mountain regions of Kauai. It has not been seen or taken elsewhere. Kirkaldy no doubt used it as the type

* In some species the median longitudinal carina may be either forked or minutely annulate, anteriorly.

† The two latter have since been badly damaged.

species for his Hawaiian sub-genus *Nesoliarus** because of its size and the prominence of the carinae of the vertex.

The measurements of the vertex are quite variable, particularly so in the width at base and at apex. The tegmina of the male are apparently immaculate; some examples have all the tegminal veins more or less flavescent, while others have these on the apical third light fuscous, and again others have the veins on the basal two-thirds more or less distinctly particolored light fuscous. The females have the tegmina more or less spotted light fuscous on the apical half, and the tegminal veins on the basal two-thirds always particolored pale and dark, much more distinctly so than in those of the male.

The appearance, in outline, of the apical third of the periandrium of the aedeagus varies more or less as in most other species, depending to a great extent on the position from which it is viewed. In one of the examples dissected, the small angular tooth on the ventral side of the periandrium (prominent, in profile, in other examples) was not present.

12. **Oliarus nubigenus** Kirk. Plate I, Figs. 3, 8; Plate IV, Figs. 52, 53.

Male. Length, 7 mm.

Width of vertex at base one and three-tenths to one and four-tenths times the width at apex; width at apex equal to width at origin of transverse carina; length twice, or else a little more than twice, the width at base; carinae of apex curved; transverse carina about one fourth (variable) from apex, either rounded or more or less sub-angulate; fossette a little wider than long, shorter at the middle than at sides, completely divided into sub-quadrate excavate areolets with the median longitudinal carina forked anteriorly.

Frons and clypeus moderately excavate; basal angles of frons tumescent; base of fork of medio-frontal carina not produced beyond apex of vertex; fronto-clypeal suture more or less indistinct; median ocellus moderately distinct.

Tegmina hyaline, somewhat shining, yellowish (in certain light), immaculate; tegminal veins either piceous or else very dark fuscous, excepting the Sc, sometimes, and the Cl 1+2, sut. and cub. apically apparently always moderately particolored; veins on the apical third always dark; granules dark and distinct. Wings hyaline, veins either fuscous or piceous.

Aedeagus with apical third of the periandrium unusually wide for such a small species, the right margin bluntly produced basad; spurs of phallus all moderate in length.

Piceous; frons and vertex fusco-piceous; pronotum sordid fuscous; tegulae either piceous or dark fuscous; carinae of frons, vertex and pronotum

* op. cit., p. 76, 1909.

fulvous; macula at sides of frons near clypeal suture large and more or less elongate, legs fusco-testaceous.

Female. Length, 8 mm.

Structurally the same as the male. The carinae of frons, vertex, etc., are much more conspicuously fulvous than in the opposite sex. Tegmina more or less spotted or banded light yellowish fuliginous on basal two-thirds with scattered dark fuscous maculae on apical third; tegminal veins on basal two-thirds brightly particolored fulvous and dark fuscous; apical third all dark fuscous.

Hab. Island of Kauai: Redescribed from six males and one female, as follows: One male in the Bishop Museum (Kirkaldy material) tagged *"halemanu"* by him in pencil (without date or collector's label); one male, Waimea district, 2000 feet, 1902 (in Dr. Perkins' collection); one male, Kaholuamano, May 8, 1920, and another male from same locality, April, 1920 (Kusche); one female, Halemanu, August 31, 1921 (Swezey); one male, Kalalau, June 18, 1922 (Bryan), and one male, Lihue, 800 feet elevation May 12, 1922 (Swezey).

There are also two females of somewhat larger size from Kaholuamano, 4500 feet elevation, May 8, 1920 (Kusche), which I refer to this species. Both show variations, but in general have the tegmina more largely maculate, and the tegminal veins more closely particolored.

Obs. This species is represented in the British Museum by one male specimen labeled "Halemanu, Kauai."

13. **Oliarus pele** Kirk. Plate IV, Figs. 56, 57.

Male. Length, 6.50 to 7.50 mm.

Vertex variable; width at base one and two-tenths to one and three-tenths times the width at apex; width at apex equal to or a little wider than at origin of transverse carina; length twice the width at base; carinae of apex more or less curvate; transverse carina about one-sixth from apex, more or less curved, sometimes sub-angulate apically; fossette wider than long, completely divided into two sub-quadrate areolets with the median longitudinal carina complete, but minutely forked anteriorly.

Frons and clypeus excavate; tumescence at basal angles of frons, in some examples, more or less obscuring the apical carinae of vertex; base of fork of medio-frontal carina very slightly produced beyond the apical carinae of vertex; median ocellus more or less distinct; fronto-clypeal suture obsolete.

Tegmina slightly milky hyaline, more or less lightly spotted or tinged

yellowish fuliginous, sometimes with a fuscous spot near fork of Cl 1+2, a smaller one at apex of suture and one or more (mostly little apparent) near lower margin of apical third. Tegminal veins on basal two-thirds more or less particolored dark and pale; apical third, costal margin and stigma (in part) dark fuscous; cross veins very slightly, if at all, suffused; granules either pale or brownish, moderately distinct. Wings slightly milky hyaline, veins dark fuscous.

Aedeagus with the apical third of the periandrium more or less variable in outline; median right spur emanating at basal third of the phallus, quite short and more or less curved; left basal spur long, sometimes reaching middle third; apical spurs stout, of medium length and well developed.

The coloration of this species is very variable in all examples studied. In general most of the examples are either fusco-testaceous or flavo-testaceous with the genae, pronotum and tegulae more or less stramineous or else testaceous; mesonotum either dark or pale castaneous; mesonotal carinae and the area between these *always* pale castaneous.

Female. Length, 7 to 8 mm.

Allowing for proportions of size and length, there are no important structural differences between the sexes. The coloration of the body parts and of the tegmina is even more variable than that of the male. In some examples the tegmina may be more or less spotted light fuscous, while in others these may be immaculate. The tegminal veins are all more or less particolored pale and dark as in the males.

Hab. Oahu Mountains. Redescribed from eleven males and five females, viz.: One male each from Kaala Mountain, June 1, 1919; Wahiawa, May 31, 1909; Tantalus, August 4, 1912; Kaumuohona, October 26, 1913; Wahiawa, July 4, 1920; Kaala Mountain (found with nymphs in soil and fern-roots) July 19, 1916 (Swezey); Palolo, September 8, 1912 (Fullaway); one male, Palolo Crater, July 31, 1917, and two males, Olympus, July 18, 1916, and July 31, 1917, respectively (Timberlake); one male June 24, 1917 (Bridwell). One female each from Konahuanui, February 22, 1914 (Swezey); Tantalus, January 3, 1909 (Giffard); Palolo, May 13, 1917 (Bridwell); Kaala, July 4, 1916, and Palolo Crater (in moss and ferns), April 8, 1917 (Timberlake).

Var. a.

A Maui form presenting no special differences in either structure or coloration and apparently just as variable on that island as the one is from Oahu. I have examined three exam-

ples, viz.: One male, Keanae, June 15, 1920, and two males, July 2, 1920 (Bryan). The latter specimen was dirty and otherwise in bad condition. I have not seen the female of this form.

Var. b.

Male. Length, 7.25 to 7.5 mm.

Female. Length, 8 to 9 mm.

Superficially, two male Oahu examples appear to be different from the preceding. Examination presented no structural differences of importance. A more elaborately maculated tegmina in one example and the larger size of both, together with normal variations in the apical outline of the periandrium of the aedeagus, are not characters sufficiently important to warrant separating it, more particularly with only two male specimens before me, both being variable and from the same island.

In the material there are five females from various localities on Oahu which may be associated provisionally with the above males. One or more of these, however, have much more flavid carinae of the vertex and frons than what might be accepted as the normal coloration of the species. The external structures of all appear to be typical, and the tegmina are more or less spotted or else banded light yellowish fuliginous with scattered fuscous maculae. The tegminal veins are alternately dark and pale (particolored) on the basal two-thirds. All the examples are from scattered localities on Oahu, no two individuals having been captured on any one date, nor more than one in each of the years recorded.

Hab. Oahu Mountains. One male each, Punaluu, August 9, 1914, and Olympus, September 8, 1912 (Swezey); one female each, Wahiawa, March 6, 1921, Pacific Heights, October 20, 1905, and Punaluu November 6, 1911 (Swezey); one female each, Kaumuohona, October 15, 1916, and Mount Olympus, October 20, 1918 (Timberlake).

Obs. Kirkaldy's tabulated description of this species included a number of females from several islands, with no accompanying males. Many of these females presented such variations in structure and coloration as to make his brief description altogether insufficient for such a variable form. The part of his material selected for the British Museum consisted of five female examples from Oahu, Kauai, Molokai, and Hawaii, and that for the Bishop Museum at Honolulu of eight females from Oahu and Hawaii. Of these latter, five belong to the division having the carinae of the fossette and of the base of the frons tumescent or flattened, and three to the division having a complete

fossette. i. e., with no median longitudinal carina. All of these also differ, more or less, in other respects, which leads to the belief that, at some time in recent years, shifting of the specimens may have placed the group label denoting the species elsewhere than was intended.

Aside from the undesirability of erecting species from females in which the sexual dimorphism is so pronounced, we have also in this instance to contend with Kirkaldy's references and part tabulated descriptions * of possible varieties of this same species on several of the islands. Due to these apparent complications, I have (provisionally at least) used the name to include specimens of both sexes, some of which may have to be separated later on. Most of these vary, more or less, one from the other either as to size or coloration, all, however, having a complete median longitudinal carina in the fossette forming sub-quadrate areolets; the mesonotum (including carinae) and frons more or less pale castaneous; the tegmina varying from yellowish to spottedly fuliginous, and with the veins on basal two-thirds alternately dark and pale (particolored). These characters follow, in very great measure, Kirkaldy's description of the female. In the circumstances it would be unwise to erect one or more species for such a variable form, more particularly as the material studied represents more often single individuals of each variety taken in numerous localities and at various dates during a collecting period of many years.

14. **Oliarus likelike** sp. nov. Plate IV, Figs. 58, 59.

Male. Length, 5.5 to 6 mm.

A small species allied to, but having more stable characters than the preceding (*pele*). It may be separated by its size, the fuscous colorations of the frons and vertex, etc., the darker particolorations of the tegminal veins, the minute annulet in front of the median longitudinal carina of the fossette, the clearly developed carinae of the apex of vertex and the base of fork of medio-frontal carina, which is narrower and not at all produced beyond the apical carinae of vertex. In some examples the upper part of the genae between the anterior margins of the eyes and fossette, in profile, appears to be somewhat longer than in the preceding species.

Aedeagus in general very similar to that of *pele*, but the three examples dissected out have the extreme apical margin of the periandrium more uni-

* Proc. Haw. Ent. Soc., Vol. II, No. 2, 1909, p. 79.

formly curved and the left apical spur of the phallus shorter, at the most not as long as the right median spur.

Female. Length, 7 mm.

Similar to the male, but having middle third of the tegmina banded, and the apical third irregularly spotted fuliginous.

Hab. Oahu Mountains, at high elevations. Described from one male and one female from Konahuanui, February 4, 1906 (Swezey); one male, Kaumuohona, August 27, 1916 (Timberlake); one male, Konahuanui, October 12, 1919 (Williams); one male, Palolo, October 6, 1906, and one female, Lanihuli, November 24, 1918 (Swezey).

Types, male and female, labelled Konahuanui, February 4, 1906 (Swezey).

Obs. Although this species has such close affinities to *pele*, it may be easily separated by the much darker colorations and other differences above noted. The late Mr. Kirkaldy, while studying the Hawaiian Cixiidae, had attached in his own handwriting the MS. name of "*likelike*" to the Konahuanui male example, which I have selected as the type.

15. **Oliarus makaala** sp. nov. Plate IV, Figs. 54, 55.

Male. Length, 5.25 mm.

This may be an extreme form of one of the varieties of *pele*. It is much shorter in length, but the structure of the vertex is practically the same as in that species, excepting that the apical carinae are distinctly curved, the basal angles of frons more tumescent, and the fork of the medio-frontal carina is longer and narrower. The tegmina differ from those of *pele*, in having most of the basal third sordidly fuliginous and the middle third lightly tinged yellowish fuliginous; tegminal veins pale, transversely particolored fuscous on the middle third, with the apical third light fuscous; cross veins distinctly suffused. In color the mesonotum is dark fuscous, with the mesonotal keels light castaneous (much as in *pele*), but otherwise the coloration is much the same as in that species.

The structure of the aedeagus appears to be closer that of *likelike* (another close ally) than that of *pele* and its varieties, slightly differing from the former in the apical third of the periandrium.

Hab. Oahu, on the Waianae Mountain range. Described from two males labelled Kaala Mountains, September 7, 1913 (Swezey).

Obs. The type is the dissected example numbered Gen. 34.

I have seen no female in the material which I can in any way match with these males. Much more material of this and its close relatives *pele* and *likelike* is necessary before some of the varieties of either can be better differentiated.

16. **Oliarus filicicola** Kirk. Plate IV, Figs. 63, 64; Plate VIII, Fig. 140.
O. montivagus Kirk.
O. kaonohi var. **volcanicola** Kirk.

Male. Length, 5 to 6.5 mm.

Female. Length, 7 to 7.25 mm.

This is the Hawaii form of a group including the three following species. It exhibits the same variation in the color of the tegmina, mesonotum, and frons. The structure of the vertex presents but little difference from its close relatives from Oahu, Lanai, and Maui, excepting, perhaps, a greater tendency in the darker varieties towards a curved rather than angulate apical carina. This feature, however, is by no means constant, as examples examined show intermediate variations. The color of the tegmina of some of the males is nearer that of *kaonohi*, but less yellowish (more clearly hyaline), while others, on the contrary, have these more or less tawny. The tegmina of the female are strongly yellowish in most examples, occasional examples being fuliginous, but not as darkly so as some from Oahu and Maui. The granules on the basal two-thirds of the tegminal veins are pale, indistinct, but always present (never quite obsolete).

The most important difference between this species and the forms from Oahu, Lanai, and Maui lies in the aedeagus. Seven examples from remote regions on the island, after dissection of the genitalia, exhibited slight variations of outline in the apical third of the periandrium, but none at all in the phallus, the latter being armed basally and apically with all spurs of normal length.

Hab. Very common in the mountain regions of the Island of Hawaii, principally on ferns.

From a large series of one hundred and thirty-one males and sixty-six females collected in the districts of Kau, Kona, Puna, Hilo, and Kohala, the following were selected and studied: Four males, Naalehu, December 12, 1905 (Swezey); two males, Kilauea, July 1903, one male, No. 692 (Kilauea), and one male, No. 685 (Kilauea), September, 1906 (Perkins); one female, Kona, 2000 feet, December, 1892; one male, Kona, 4000 feet, 1896 (Perkins); one male, No. 656 (Kilauea), August, 1896, (Perkins); three males, and one female, Glenwood, Olaa, 2300 feet, August 27, 1917 (Giffard); one male, Glenwood, March 2, 1919; one male and one female, Kohala Mountains, May 24,

1917; one male and one female, Kaiwiki, September 22, 1918; one male, Kilauea, August 4, 1919; one female, Kilauea, May 15, 1911, and one male and one female, upper Hamakua Ditch trail, July 31, 1921 (Swezey); one male and one female, "Twenty-three Miles," Olaa, 2300 feet, September 9, 1919 (Fullaway); one male (5 mm.) Kealakakua, 3000 feet, August 8, 1919 (Timberlake), and one male, Kilauea (no date) (Kirkaldy).

Type, male, is labelled Naalehu, Hawaii, December 12, 1905, on ferns (Swezey).

Type, female, labeled Kona, 2000 feet, December, 1892 (Perkins).

Obs. Kirkaldy's *filicicola* is not represented in the collections of the British Museum, but his material in the Bishop Museum, Honolulu, contained a male example bearing a tag marked with that name, in pencil, in his handwriting, labelled "Naalehu, Hawaii, December 12, 1905, on ferns." Three more male specimens bearing same label were found among the Swezey material. In Dr. Perkins' personal collection there were two males (mounted on card) labelled from Kilauea, Hawaii, August, 1903, with a tag attached, "I have a note that these were compared with *filicicola* and are that species." Another specimen identical with the latter was found under the name of *kaonohi* in the Kirkaldy material (labelled 692, Kilauea, Hawaii, Perkins). These are of the variety with pale frons and mesonotum.

The lengths of the male and of the female are very variable and not to be relied upon as in some of the other species. There are in the collections many variable examples where both sexes (the tegmina of the male pale and that of the female dark yellowish) have been captured together in widely separated regions at the same time and apparently on the same host plant. The sexual dimorphism in all of these is such that it would confuse rather than help matters were the species divided into varieties. All are undoubtedly the Hawaii form of *kaonohi* of Oahu, *koele* of Lanai, and *halehaku* of Maui.

O. montivagus Kirk. comes after *filicicola* in his table, and is there tabulated * as a species with the mesonotum black, teg-

* Not otherwise described.

minal veins on the basal two-thirds sometimes with dark granules and with the exterior keels of the mesonotum straight. A single male specimen from Kilauea is in the British Museum to represent that species. The Kirkaldy material in the Bishop Museum has three male specimens determined as *montivagus*, one of which, No. 685 (i. e., Kilauea, September, 1906, Perkins), is tagged as such in pencil in his handwriting. The aedeagus of these was dissected out and found identical with that of the *filicicola* type. I have seen no examples of *montivagus* having dark granules on the tegminal veins, and any value attached as to whether the mesonotal keels are straight or sub-parallel to the interior ones will not hold in either this or other local species, at least not when there is an abundance of material to study. The darker color of the mesonotum and frons of some male examples is merely a modification of the color in that sex, some specimens when captured being dark, while others are pale. On the contrary, all females taken with the males are always pale, never dark. This sexual dimorphism of color in this species has heretofore caused much confusion in determinations, but the paired males and females taken at same time and place which have been selected among the paratypes are confirmative of the above fact. These paired examples should be kept together in the collection which contains the Holotype and Allotype. In all the circumstances I have deemed it best to consider *montivagus* as a synonym of *filicicola*.

Kirkaldy's Hawaii var. *volcanicola* of *kaonohi* is synonymous with *filicicola*, the Hawaii form of *kaonohi* from Oahu.

Referring to remarks (see Obs. under *kaonohi*) in regard to cross-breeding and to the drifts by transmission in this particular group, it might be well to further observe that *filicicola* should, perhaps, take precedence to *kaonohi*, the transitional stages beginning with *filicicola* from Hawaii, and then on to *halehaku* from Maui, *kaonohi* and *koele* being intermediate forms from Oahu and Lanai, respectively. If *immaculatus* (placed provisionally in Division D) is accepted as the Kauai form, then the structure of the aedeagus would place it next to *filicicola*. This cannot be fully decided until Kauai has been more closely collected for further material.

17. **Oliarus kaonohi** Kirk. Plate IV, Figs. 61, 62.
Oliarus silvicola Kirk.

Male. Length, 5 to 6 mm.

The measurements of the vertex of this common species are very variable. Width at base one and one-tenth to one and three-tenths times the width at apex; width at apex one to one and one-tenth times the width at origin of transverse carina; length, one and seven-tenths to two and three-tenths times the width at base; carinae of apex slightly converging, very little curved, if at all; transverse carina about one-fifth from apex, curved; fossette very little wider than long, mostly shorter at the sides than at middle, divided into two sub-quadrate areolets by a median longitudinal carina. In odd examples this carina is more or less obsolete anteriorly, mostly due to the obscurity or absence of the annulus, which latter may or may not be present.

Frons and clypeus moderately wide and excavate; basal angles of frons not tumescent; base of fork of medio-frontal carina faintly, if at all, produced beyond apex of vertex, sometimes obscure; fronto-clypeal suture and median ocellus more or less obscure.

Tegmina immaculate, yellowish (sometimes, in part, milky) hyaline, with the clavus in most examples more or less yellowish fuliginous; tegminal veins on the basal two-thirds pale stramineous (more or less dilute in some examples), shading off into ochraceous on the apical third; granules more or less distinct, either partly or quite pale or else distinctly brownish. Wings hyaline, veins testaceous to light fuscous.

Color exceedingly variable. Frons, vertex, mesonotum, pronotum, and tegulae either pale or dark castaneous or else fusco-piceous; mesonotal keels variable, either pale or dark; macula at sides of frons near clypeal suture, always absent regardless of the color of the frons.

The structure of the aedeagus does not differ materially in the examples dissected out from eleven extreme and intermediate forms.

Female. Length, 6.5 to 6.75 mm.

Structurally the same as the male, but much more variable in color. The mesonotum and frons vary from pale castaneous to fusco-piceous, and the tegmina from yellowish hyaline to dark fuliginous, some examples of the latter having the costal cell dilute.

Hab. Distributed generally on ferns on all the mountain ranges of Oahu. Redescribed from twenty-two males and twenty-three females of extreme and intermediate color examples from Konahuanui, Olympus, Tantalus, Manoa, Maunawili, Nuuanu, Halawa, Waiahole, Wahiawa, and Mount Kaala, collected by Perkins (1900-1906), Kirkaldy (no date), Blackburn (no date), Swezey (1906-22), Giffard (1905-15), Kotinsky (no date), Timberlake (1916-20), Bridwell (1917), Fullaway

(1912-16), and Williams (1920). These were selected from a large series of three hundred or more males and females collected between 1900 and 1922 from the same or adjacent localities. Some of the older specimens were received either mildewed or otherwise damaged.

Obs. Kirkaldy, in his tables, divided this very common Oahu form into two species, viz.: *kaonohi* (with pale mesonotum) and *silvicola* (with dark mesonotum). The former is represented in the British Museum collection by a male and female (on same card) labelled "Honolulu," and marked by Dr. Perkins as *kaonohi*. *O. silvicola* is not represented at all in the British Museum, but the Kirkaldy material left with the Bishop Museum, Honolulu, had one specimen tagged in pencil "*silvicola*" by Kirkaldy in his own handwriting, this being, presumably, his type of the latter. As both are the same species, and as *kaonohi* was tabulated * first by Kirkaldy, it must take priority over *silvicola*, which latter is, in consequence, synonymized.

The granules on the basal two-thirds of the tegminal veins, while quite distinct in some examples, may be more or less obscure in others, but these are never quite absent. Examples of the species from various localities taken at one and the same time exhibit very much the same variation in distinctness and coloration of the granules as in many other of our local species. Probably because of the little material before him, Kirkaldy evidently found it convenient to stress this character in his tables in connection with one or more of his species, but large series of examples reveal that the distinctness and coloration of the granules on the tegminal veins cannot always be accepted as constant within a species.

The females of *kaonohi* and its insular forms with the dark fuliginous tegmina should not be confused with those of *morai*, notwithstanding the apparent similarity in coloration. Undoubtedly, both these species are close relatives, and were it not for the fact that the transitional stages between all our insular forms must be recognized in order to secure reasonably satisfactory results in their classification, *morai*, like many other of such insular forms, would not be given specific value. There are,

* Not otherwise described by Kirkaldy.

however, always more or less distinctive characters, although these in their turn may also be variable, which allow us to separate one form from the other and thereby prevent unnecessary confusion.

Occasional examples in both sexes of *kaonohi,* and similarly with *morai,* exhibit tendencies to drift into one or the other of the two divisions, C and D, not only because of either a complete or incomplete median longitudinal carina of the fossette, but also because of the great similarity in the dark fuliginous pigment covering the whole tegminal surface of some of the females. The aedeagus of the male in both species is of the same general form, although such characters as the presence or absence of one or both basal and apical spurs on the phallus are constant in all examples dissected, and quite sufficient to further differentiate the two species. It is suspiciously evident that either both forms are the result of cross-breeding, or that one of these is still evolving from the other.*

In the large amount of material before me I have seen no males of *kaonohi* or of its other insular forms which could be matched with the females which have very dark fuliginous tegmina. On the other hand, *morai* (a much larger species) has this dark coloration represented in both sexes.

18 **Oliarus koele** sp. nov. Plate IV, Figs. 70, 71.

Male. Length, 5 to 6 mm.

Female. Length, 7 mm.

Closely related to and structurally much like the preceding. It is also equally variable in the coloration of the frons and mesonotum. In all the male examples before me, the tegmina appear in general to be more clearly hyaline, with the yellowish fuliginous color of the clavus absent and the granules on the tegminal veins pale and less distinct.

The aedeagus is of the same character as the preceding, except that in all the examples dissected out the basal and the eight apical spurs of the phallus are longer and the left apical spur either quite absent or else rudimentary. The apical third of the periandrium is more or less variable in outline, but retains the general form of its ally.

In color the females are variable, but compare favorably with some of the lighter examples of the Oahu form. In the large series examined there

* See observations under *morai* relative to the dissection of a male and female taken in copula.

are no female specimens with dark fuliginous tegmina. Structurally it is like the male, but larger.

Hab. Island of Lanai at 2500 to 3400 feet elevation. Described from four males and six females selected from a series of eighty-three specimens of the former sex and sixty-three of the latter, all collected in 1916-17 by Munro and Gibson (labelled H. G.).

Type, male, labelled H. G. 54, 3000 feet elevation, January 12, 1917 (Gen. 18, A).

Type, female, labelled H. G. 29, 3000 feet elevation, December 18, 1916.

Obs. This species is as common on Lanai as *kaonohi* is on Oahu, and was reported as taken mostly on ferns. The remarks regarding *kaonohi* are also applicable to this species. Closer collecting will no doubt result in finding the female with the dark fuliginous tegmina, which is on both Oahu and Maui. Of the four examples of the aedeagus dissected out, one had the minute left apical spur of the phallus very membraneous and hardly perceptible, except under high power magnification, while the right apical spur was much better developed than that in *kaonohi*.

19. **Oliarus halehaku** sp. nov. Plate IV, Figs. 68, 69.

Male. Length, 5.5 to 6 mm.

Female. Length, 6 to 7.5 mm.

Structurally the same as the three preceding species. The coloration of the mesonotum and frons of the males is very variable as in the other insular forms, varying from pale stramineous to fusco-piceous, and the tegmina from stramineous to yellowish fuliginous. Like the Lanai form, the darker coloring of the clavus is seldom, if at all, noticeable. The pronotum of the male is consistently stramineous throughout the series, much lighter in shade than in the preceding insular forms, while in some of the darker examples there are evidences of a small but obscure yellow spot at sides of frons near fronto-clypeal suture.

The basal spur of the phallus is well developed and longer than that of *koele*, while the apex is quite devoid of spurs in all ten examples dissected. Like its three allies, the right median spur is long and stout, even more prominently so than in either of these.

The female is structurally the same as the male, but varies more as to length, the mesonotum and frons exhibiting the same extremes as in its

allies. The tegmina vary from yellowish hyaline to dark fuliginous, the latter color varieties having the costal cell strongly dilute.

Hab. Island of Maui at elevations up to 6000 feet. Described from twelve males and nine females (selected from the larger series) collected between 1908 and 1920 at Wailuku, Iao Valley, Nahiku, Waikamoe, Honomanu, Olinda, Halehaku, Kailua, Keanae, and Haleakala, by Swezey, Bryan, Timberlake, Giffard, and Fullaway. The large series, exclusive of the above, comprises forty-two males and sixty-three females collected, 1908-20, by the same individuals from the same localities and, in addition, from Hana, Haipuaena, Wailuanui and Wailuaiki. A number of the Haleakala specimens are labelled as taken from *Sadleria*, also *Pipturus*.

Type, male (light form Gen. 50), labelled Nahiku, September 1, 1908 (Swezey). Paratype, male (dark form Gen. 47), labelled Halehaku, June 24, 1920 (Bryan).

Type, female (light form), labelled Nahiku, September 1, 1908 (Swezey). Paratype, female (dark form), labelled Halehaku, June 24, 1920 (Bryan).

Obs. Commonly distributed in all localities on the island and, like the three preceding forms, exceedingly variable in color. West Maui examples appear to be generally paler in color than those on the windward side of East Maui, although there are intermediate color varieties in localities between these two regions. The structural outline of the apical third of the periandrium of the aedeagus shows a variation in some of the examples dissected, and in one of these the basal spur of the phallus is shorter than in all the others. The total absence of apical spurs on the phallus indicates that the transitional stages had approached the *tarai-morai* group. (See notes under *kaonohi*.)

Division D.†

*Fossette of vertex incompletely divided by a median longitudinal carina, the basal portion of the dividing carina more or less evident, but never reaching the apical carinae of vertex.** (See Plate I, Fig. 4.)

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† An intermediate division.

* Within the species there are occasional examples in which the dividing median carina may be either almost complete or quite absent.

20. **Oliarus immaculatus** sp. nov. Plate I, Fig. 4; Plate IV, Figs. 60, 65; Plate VI, Fig. 106.

Male. Length, 7 mm.

Width of vertex at base one and two-tenths to one and four-tenths times the width at apex (at point of origin); width at apex equal to width at origin of transverse carina; length one and six-tenths to one and seventenths times the width at base; carinae of apex obliquely angulate, more or less coalescent with lateral carinae of the fork of the medio-frontal carina; transverse carina, about one-fourth from apex, more or less curvate; fossette angulate, excavate, apparently produced anteriorly into areolet of fork of medio-frontal carina; median longitudinal carina more or less developed, but not complete.

Frons and clypeus excavate; lateral carinae of fork of medio-frontal carina more or less coalescent with carinae of apex of vertex, base obsolete or at most very obscure. In profile the upper part of the genae between the anterior margins of the eyes and fossette more or less shortened.

Tegmina dark yellowish, clouded or sub-opaque, immaculate; tegminal veins immaculately pallid except at extreme apical third, where they become slightly flavo-testaceous; stigma light castaneous; granules mostly indistinct. Wings hyaline, veins light fuscous.

Mesonotum, vertex, frons, etc., sordidly light castaneous; pronotum, tegulae, and legs stramineous.

Female. Length, 8 mm.

The female is like the male in appearance and structure, the coloration of the body structures being, however, somewhat darker.

Hab. Kauai. Described from four males and two females, Kokee, June, 1919 (Osborn); three males, two females, and seven nymphs (ex fern), Lihue, March, 1912, and two males, Summit Camp, April, 1922 (Swezey); one male, Kaholuamano, April, 1920 (Kusche).

Types, male (Gen. 56c) and female are Kokee specimens labelled June 10, 1919 (Osborn).

Obs. In certain respects the external characters and the aedeagus of this aberrant species appear to have affinities to those of the *filicicola-kaonohi* group. The uniform absence of the base of fork of the median-frontal carina, the coalescence of the apical carinae of the vertex with the lateral carinae of the frontal fork gives an unusual appearance to the fossette. Whether or not the base of the medio-frontal fork is found later on to be distinct in some specimens among a larger series, the lengthened apical carinae of vertex and the angulate base of the

frons will quickly separate it from other species superficially resembling it. The present series was taken from four different mountain localities, all more or less isolated from each other by deep canyons.

One of the Kokee females studied is a very dark-colored form and presents the only color variation noted in the series. The lateral margins of the pygofer of the male are clothed with unusually long setae.

21. **Oliarus tarai** Kirk. Plate V, Figs. 72, 73, 74, 75.

Male. Length, 6.5 to 7.25 mm.

Width of vertex at base one and four-tenths to one and five-tenths times the width at apex; width at apex same as the width at origin of transverse carina; length one and two-tenths to one and three-tenths times the width at base; carinae of apex more or less curved (in some examples the carinae appear slightly oblique rather than curved); transverse carina about one-fourth from apex, more or less sub-angulate; fossette broader than long, rotundate and somewhat excavate anteriorly, the median longitudinal carina more or less produced into two very minute sharp keels which appear to completely divide the fossette medianly, space between the keels very narrow and shallow; lateral carinae, viewed in profile, arcuate.

Frons moderately excavate; fork at base of median carina rounded, sometimes flattened or quite obscure, produced but slightly, if at all, into the area of fossette of vertex.

Tegmina whitish hyaline at middle third; basal and apical thirds entirely dark fuliginous (very rarely light fuliginous). Tegminal veins testaceous at middle third, dark fuscous at basal and apical thirds. Stigma and costa dark to light fuscous. Wings dark fuliginous apically, veins fuscous.

Aedeagus with the right margin of the periandrium near apex more or less acutely produced (in somewhat immature examples this part of the structure is very membraneous, causing an abnormal lipping over of the apical margins); right median spur sinuous, ample, very broad at base; base and apex of phallus without spurs or spines; in lateral view the ventral margin near apical third has the tooth well formed and stout.

Piceus, pronotum, and tegulae most always immaculately yellow; interolateral margins, carinae of vertex, frons and clypeus fulvous; legs testaceous to fuscous; macula at lateral margins near base of clypeus moderately large, but variable.

Female. Length, 7.5 to 8 mm.

Structurally similar to the male. In coloration it differs from the male, as follows: Mesonotum and frons immaculately ferrugino-testaceous, sometimes fulvous, or else fused fulvous; legs either fulvous or flavo-testaceous;

pattern of tegmina more variable, the lighter fuliginous examples predominating.

Hab. Oahu, at various elevations from 1300 to 2500 feet. Redescribed from seventeen males and six females from Waianae, Honolulu Mountains, Palolo, Tantalus, Punaluu, Waialua Mountains, Konahuanui, Kaala Mountains, 1892-1922, by Perkins, Koebele, Swezey, Giffard, Timberlake, Fullaway, and Bryan.

Obs. There are five specimens under the name of *tarai* in the collections of the British Museum, but none marked "*type*." The figure in Fauna Hawaiiensis was made from a Waianae example. From Mr. Kirkaldy's material in the Bishop Museum, I have selected as the lectotype a Waianae male example collected by Dr. Perkins in April, 1892. It is quite typical of most examples of that sex which I have studied and included in the description.

A male (Kaala Mountain, July, 1916, Swezey) example was found to be abnormal. It is much smaller than the rest of the series, and dissection of the genitalia revealed the apex of periandrium of the aedeagus to be slightly different from others dissected. In all other respects the genitalia was found to be typical. It is evident that in this species the female is superficially very variable in color, and quite likely to cause errors in determinations.

Var. a.

There appears to be even greater plasticity in the structure of the fossette of vertex and in the general coloration of this Hawaii variety than in the Oahu form. Until more material is collected from other localities and regions of the island and studied, it would not be advisable, for the present at least, to give it more than varietal value.

Median longitudinal carina of fossette of vertex very variable, in some examples complete and in others incomplete. It appears to differ from the Oahu examples in coloration, as follows: Fuliginous area at basal third of tegmen extends more or less along Cl 1+2 to its junction with the commissure; center of apical third more or less irregularly hyaline with the anterior margin of the pigment extending across the costal cell to the costa; middle third clear hyaline with the veins and granules much darker. In general all the body parts are very much darker, and the pronotum and tegulae tend to be more sordidly yellow or else fused fuscous.

The female is structurally the same as examples from Oahu, but the pattern and coloration of the tegmina is in a measure more variable. There are examples which have the fuliginous band at apical third more or less

interrupted or entirely broken, and one or more others where this band is but little apparent. The fuliginous pigmentation extending across the costal cell is always present as in the male, but there are instances where this is less typical of the variety.

Hab. Island of Hawaii. Two males, Kohala Mountains (upper Hamakua Ditch Trail), September, 1919, and one male and three females, South Kona, August, 1919 (Swezey): one male and one female (no locality or date label) and one female (no date) labelled Kona (Perkins); two females, Kilauea, 4000 feet, July, 1918-20 (Giffard); one male labelled Waimea, Hawaii (no date), Perkins.

Obs. The example from Waimea is very much undersized, and the pattern of the tegmina follows precisely that of the Oahu examples, excepting that the coloration of the apical third is extended across the costal cell, as in all the other Hawaii varieties.

Of five dissections made of the male genitalia, there was only one which showed an appreciable difference in the aedeagus from that of the Oahu examples. This was in one of the two Kohala Mountain examples (Gen. 39F), which was found to have a very minute median spine or spur on the left side margin of the phallus, and another but larger one at the apex. A dissection of the other Kohala example (both taken in same locality within a day of each other) revealed the aedeagus to be typical.

The fact that occasional rudimentary spurs may be attached to the phallus, as previously mentioned, emphasizes the observations made in connection with the transitional stages of *kaonohi* into *tarai* and *morai*. It would not be surprising to find occasional "sports" of the Oahu form of *kaonohi* without any apical spurs at all on the phallus. The Lanai form of the latter species in all examples studied exhibits one very rudimentary spur (sometimes two), and the Maui form none at all—which, in the main, agrees with some of the *tarai* and *morai* examples.

22. **Oliarus neotarai** sp. nov. Plate IV, Figs. 66, 67.

Male. Length, 5 to 5.5 mm.

Width of vertex at base one and one-tenth times the width at apex; width at apex one to one and two-tenths times the width at origin of transverse carina; length one and seven-tenths to one and eight-tenths the

width at base; carinae of apex practically same as in *tarai*; transverse carina one-fifth to one-seventh from apex, more or less sub-angulate or else rounded; fossette much broader than long at middle, rotundate and moderately excavate anteriorly; median longitudinal carina almost complete with the minute and acutely ridged keels (plainly seen in *tarai* and its forms) little apparent or else very obscure.

Frons very moderately excavate; base of fork of the median carina rounded, more or less obscure and slightly produced into area of fossette of vertex.

Tegmina dark fuliginous at basal third, the pigment extending along the whole claval area to and including the apical third or more, middle third with a moderately large whitish hyaline area between cubitus and costa, but not including the extreme base of costal cell, which is always colored fuliginous. Tegminal veins light to dark fuscous, granules very distinct. Costa and stigma dark fuscous. Wings more or less fuliginous or fumose over the apical third, veins dark fuscous.

The aedeagus differs from that of *tarai*, in the following: Apical third of periandrium much less wide, more prolonged, converging toward the rounded apex and with the right margin more produced and acute; apical half of phallus more elongate and less wide, with a well-defined but moderately long and narrow spur at base, and one only (the right) at apex. The tooth on the ventral margin (viewed laterally) of the periandrium in this species is small and sub-acute.

Piceus, mesonotum and frons sometimes fusco-piceus; margins of pronotum, tegulae and lateral carinae of vertex, sordid yellow; carinae of frons more or less fulvous with the median carina quite often without coloring at all; the yellowish macula so often seen at lateral margins near base of clypeus, if at all present, is indeterminate; legs more or less dark fuscous.

Female. Length, 6 to 6.5 mm.

Same as the male structurally and in coloration, excepting for the usual sexual differences in length and size of the vertex. Several color varieties taken on Mount Kaala by Mr. Timberlake have the mesonotum sordidly castaneous and the tegmina fuliginous.

Hab. Oahu at elevations from 2000 to 4000 feet. Described from thirteen males and three females, as follows: One male, Kaala Mountain, 4000 feet, July 9, 1916, and two males, Kaala Mountain, July 4, 1916 (Timberlake); one male, Kaala Mountain, December 28, 1919 (Williams); four males, Mount Kaala, May 18, 1920, one male, July 4, 1916, and one male, July 9, 1916 (Swezey); two males, Konahuanui Mountain, July 25, 1920 (Bryan), and one male same locality, June 17, 1917 (Bridwell); one female, Lanihuli, May 25, 1919 (Swezey); one female,

Kahuauli, July 16, 1922, and one female (less typical) from Mount Olympus, February 25, 1922 (Bryan).

Type, male, labelled Kaala Mountain, 4000 feet, July 9, 1916 (Timberlake).

Type, female, labelled Lanihuli, March 25, 1919 (Swezey).

Obs. This small species has close affinities to *tarai*, but is easily separated by the structure of fossette, the coloration of the tegmina, etc.

23. **Oliarus morai** Kirk. Plate V, Figs. 76, 77.

Male. Length, 7.25 to 7.75 mm.

Width of vertex at base one and two-tenths to one and four-tenths times the width at apex; width at apex same as the width at origin of transverse carina; length one and three-tenths to one and six-tenths times the width at base; carinae of apex same as in *tarai*; transverse carina about one-fourth from apex, more or less truncate; fossette transverse, quadrate-rotundate, slightly excavate anteriorly, median longitudinal carina more or less produced when at all present.

Tegmina entirely dark fuliginous or, at most, a little dilute medianly. Wings fuliginous apically, with the inner margins fumose; veins dark fuscous.

Coloration in general darker than *tarai*, one example being entirely piceus.

Aedeagus the same as in *tarai*, excepting that the right (dorsal) side margin at the apex of the periandrium is not acutely produced, but laps or folds over. This character is, however, liable to prove variable in some examples, due to the thin membranous nature of the structure at the apex in this as well as in the preceding species.

Female. Length, 8.5 to 9 mm.

Structurally, the female is very similar to the male. The immaculate dark fuliginous color of the tegmina is also the same, but the mesonotum is dark fuscous, with the mesonotal carinae pale to dark castaneous.

Hab. Molokai Mountains, at 4000 feet elevation. Redescribed from the following examples: One male and one female labelled 589 (Molokai, 4000 feet elevation, June, 1896); one male and one female, Molokai Mountains, 4000 feet, 1893. (These form part of the Kirkaldy material deposited at the Bishop Museum and collected by Dr. R. C. L. Perkins.) One male labelled Molokai, 4000 feet, February, 1902 (Perkins), and one male, Kamoku, Molokai, July 15, 1910 (Fullaway).

Obs. This species is represented in the British Museum collection by a female which Mr. Kirkaldy marked as the type (described and figured in F. H. as *tarai* var. *morai*). Later Kirkaldy raised it to a species by including it as such in his descriptive tables [1] of the Hawaiian Oliarus. The structures, including the aedeagus, are not much different from its close ally (*tarai*), but these differences, to which may be added the immaculate dark tegmina and much darker coloration of the body structure, are of sufficient importance to warrant their separation. The same may also be said of some other forms or species which neither Kirkaldy nor the present author has hesitated to separate by giving them specific value. As I have stated elsewhere, the lumping of such varied insular forms into a single species would simply add to the confusion which dimorphism, sexual and otherwise, has already caused workers in this homogeneous and purely geographic sub-genus.

Although the author has before him for examination and study all of the collections of Hawaiian Cixiids which have been made during the past thirty years or more, excepting only about two score specimens of the Kirkaldy material which are in the British Museum, only six individuals of this dark-colored form are available for study. It is apparently rare and restricted to the mountains of the Island of Molokai, as it has not been collected from elsewhere in the Territory during the above period. It is evidently one of the transitional forms of *kaonohi*.

24. **Oliarus neomorai** sp. nov.

Male. Length, 7.5 mm.

Structurally the same as in the preceding (*morai*), but quite different in coloration. Tegmina either immaculately yellowish hyaline or with a part of the apical third more or less suffused light fuliginous. Wings largely fuliginous apically. Mesonotum, vertex, and frons fusco-piceus. Mesonotal carinae more or less castaneous. Carinae of frons and vertex fulvous. Pronotum and tegulae typical. Legs more or less fusco-testaceous. All the examples studied have the fossette of vertex without any median longitudinal carina, or at most the latter is very rudimentary. Aedeagus the same as in *morai*.

Female. Length, 8.5 to 9 mm.

The female, except in proportion to size, is practically of the same struc-

[1] Proc. Haw. Ent. Soc., II, No. 2, September, 1909, p. 77.

ture as the male, but varies very largely in coloration. The tegmina of the Molokai and Maui forms have the same color appearance as in the male, excepting that the whole of the apical third is more or less yellowish fuliginous; others have the tegmina inmaculately of the latter color, while the single Lanai example has them much darker than the others. None of those examined has the color of the tegmina typical of the species. Mesonotum with the discal portion, including carinae, either all pale castaneous or else fused with fuscous, sides always darker. Pronotum and tegulae immaculately stramineous, the latter sometimes sordid. Margins of vertex narrowly and of the frons widely (particularly at base) fulvous. Clypeus and legs largely fulvous. Inter-frontal and clypeal areas and the abdomen dark fuscous.

Hab. Male. Molokai Mountains. One male labelled 193 (Kalae, June 9, 1893), one male, No. 589 (4000 feet, June, 1896), and one male (damaged) 1896—all in the Kirkaldy material (Perkins); three males Kamoku, July, 1910 (Fullaway).

Female. Molokai, Lanai, and Maui Mountains. One female, Kamoku, Molokai, July, 1910 (Fullaway); one female, Lanai, 2500 feet, December, 1916 (Munro-Gibson); two females, Keanae, Maui, August, 1918 (Swezey), and one female, Honomanu, Maui, June, 1920 (Bryan).

The male type is the Kalae example.

Var. a.

Female. Length, 8 to 9 mm.

The Oahu females differ in the structure of the fossette and in the transvere carina of the vertex. In the fairly large series examined the median longitudinal carina of the fossette is either quite or almost complete, never quite absent. The transverse carina is less truncate and the coloration is exceedingly variable. Mesonotum, the vertex, frons and clypeus either immaculately testaceous, or a pale castaneous, or else the disc of the mesonotum is sordidly fused pale castaneous with fuscous, the sides of the latter never dark fuscous as in the typical *neomorai*. Pronotum, tegulae and legs as in typical *neomorai*. Tegmina very variable, no two, as it were, quite alike in color and pattern. This may most probably be due to the crossing of intermediate and extreme varieties. All in all the larger number of examples have the apical and basal thirds dark yellowish fuliginous and the middle third lighter and more hyaline. Wings more or less fuliginous or fumose over the apical third.

The one or two females of this variety labelled from "Hawaii," or else with "Hawaii ?" compare favorably with those described from Oahu.

Hab. Oahu and Hawaii, from 1300 to 4000 feet elevation.

Thirteen females from Oahu, as follows. Honolulu Mountains (Perkins); Tantalus, 1905-1907 (Giffard); Mount Kaala, 1916 (Timberlake), 1917 (Bridwell); one female, Waimea, Hawaii, October, 1906 (Swezey); one female, (a darker variety) Kilauea, Hawaii, June, 1908 (Giffard); one female labelled "Haw. ?" without date (Perkins), and one female labelled "Oahu ? Hawaii ?", *"taken in copula,"* 1897 (Perkins).

Obs. In the collections before me I have been unable to find any males which could be associated with the females placed under variety **a**, with any degree of certainty. I have little doubt but that the latter are merely varietal forms of either *morai* or *tarai* or of both. The female example above referred to as taken *"in copula"* by Dr. Perkins in 1897 (which I believe is the first and only one collected in Hawaiian territory in actual copulation) had the genital organs of a male still in contact, and with the aedeagus still "in situ" in the oviduct of the female. Unfortunately, no part of the male, other than the abdomen, remained attached to the specimen. Dissecting out the aedeagus revealed the structures to be typical of *tarai*. As the latter species is on both Oahu and Hawaii, the particular island on which this male and female were taken is still in question.

Division E.

*Fossette of vertex entirely undivided by a median longitudinal carina or, at most, the basal portion of the carina when present is rudimentary or obscure.** (See Plate I, Figs. 5 and 6.)

25. **Oliarus hevaheva** Kirk. Plate I, Fig. 5; Plate V, Figs. 84, 85.

Male. Length, 8 to 9.25 mm.

Width of vertex at base one and six-tenths to one and seven-tenths times the width at apex; width at apex one and one-tenth times the width at origin of transverse carina; length one and six-tenths times the width at base. Apex sub-truncate; transverse carina curvate, about one-third from apex; fossette complete, quadrate-excavate, very slightly tumescent posteriorly; lateral carinae—in profile—below origin of transverse carina, subarcuate.

Frons and clypeus excavate; base of fork of medio-frontal carina wide,

* In occasional examples, within some of the species, very obscure traces of the fork referred to in foot note under Division C, may be seen under the binocular.

either curved or else obscurely sub-angulate, slightly produced into the fossette of vertex.

Tegmina tawny hyaline, costal margins notably thickened and arched at base; immaculate on basal two-thirds, excepting for a dark brown spot on Cl 1 + 2, and another at apex of costal cell; apical third with an irregularly curved, and sometimes interrupted, dark brown band following (in most part) the extreme apical margin. Tegminal veins on basal two-thirds light to dark fuscous, and on apical third fusco-piceus. In some examples the suture is lighter in color, and others have the sub-costa faintly particolored. Stigma more or less pallid. Wings largely fuliginous apically, veins fuscous.

Mesonotum fusco-piceus, with the intermediate carinae more or less light castaneous. Pronotum, tegulae, vertex, and frons dark fuscous, margins flavescent. The flavid maculation at lateral sides near base of clypeus (present in most all Hawaiian species) large. Legs more or less testaceous.

Female. Length, 10 to 11 mm.

The female differs from the male mainly in size and in the coloration and pattern of the tegmina. Tegmina clear hyaline, sometimes suffused yellowish fuliginous. The curved dark brown band on the apical third of the male is replaced by sparse and more or less remote spots, and the middle third, sometimes, with one or more maculae. Tegminal veins on the basal two-thirds particolored dark brown and white or pale yellow, excepting the suture, which is mostly brown (one example has the larger part of the sub-costa and radius dark brown); on the apical third the veins are all dark and the cross veins more or less suffused.

Hab. Hawaii, Kona district. Redescribed from ten males and eight females, viz.: One male and one female, Kona, 2000 to 3000 feet elevation, 1892, in the Kirkaldy material in the Bishop Museum (Perkins); two males, South Kona road, 1600 to 1900 feet elevation, August, 1917, and one female, Kawaloa (Coast), May, 1912 (Giffard); five males and one female (Timberlake), and one male (Swezey) at various points along the North and South Kona roads, August, 1919; one male and one female, Hilo district, 1000 feet elevation, July, 1906 (Perkins); one female labelled "Haw. Isles," November 9, 1904 (Russel), and three females, South Kona, August 31, 1924 (Giffard).

Obs. Kirkaldy's type specimen in the British Museum is a male from Kona, Hawaii.

The Perkins' Hilo district examples have the tegminal veins on the basal third largely pallid and in other minor respects the venation differs from the specimens taken in the type locality.

The Russel example is much more typical in the coloration of the veins.

26. **Oliarus lanaiensis** sp. nov. Plate V, Figs. 80, 81.

Male. Length, 8.5 mm.

Structurally, like *O. hevaheva*, excepting that the apex of vertex appears to be more sharply truncate and that the base of the fork of medio-frontal carina is less wide than in that species.

Tegmina light yellowish hyaline, immaculate on basal two-thirds except for the typical brown spot at apex of costal cell; apical third sparsely maculate. Claval veins particolored light fuscous and fulvo-testaceous, with all the suture flavid; the cubitus light to dark fuscous, the media in part and the radius altogether fuscous, Sc + R and costal vein testaceous, sparsely particolored whitish; veins on apical third, the costa and stigma dark fuscous. Costal margin notably arched and much thickened at base as in *hevaheva*. Wings lightly fuliginous apically.

Piceus; margins of pronotum and tegulae very narrowly and sordidly testaceous; intero-lateral area of vertex at base and the fronto clypeal carinae lightly castaneous; the pale area at lateral margins near base of clypeus small, sordid; legs sordidly fusco-testaceous.

With the exception of the apical third of the periandrium, which has the lower side margin longer and more acute, the aedeagus is the same as in *hevaheva*.

Hab. Lanai. A single male (the type) in the forest at 2000 feet elevation, December, 1916 (Giffard).

Obs. This is practically a color variety of *hevaheva*. Were it not for the lighter coloration and the different pattern of the tegmina and also the darker body characters, it might well be taken for that species.

27. **Oliarus olympus** sp. nov. Plate V, Figs. 78, 79; Plate VI, Fig. 109.

Male. Length, 8 to 9 mm.

Vertex twice the width at base as at apex; width at apex one to one and one-tenth times the width at origin of transverse carina; length almost twice the width at base; apex truncate; transverse carina almost one-fourth from apex, curved; fossette sub-quadrate, excavate, somewhat tumescent at sides, more so posteriorly at middle, where the median longitudinal carina is at most very rudimentary; lateral carinae of vertex and of the frons (seen in profile) moderately arcuate.

Frons and clypeus narrower than in *hevaheva* and more excavate; frontal fork at base more or less obscurely impressed, not produced into apex of vertex.

Tegmina light yellowish hyaline, two and a half times longer than broad at middle; costal margins slightly less, "notably arched and thickened at base" than in *hevahera*; basal two-thirds immaculate except for the spot at apex of costal cell; apical third more or less broadly and irregularly spotted brown. Stigma light to dark brown. Tegminal veins generally as in *hevahera,* but there are examples which, in great measure, are parti-colored on the basal two-thirds, as in *lanaiensis*. Wings hyaline, more or less fuliginous or else fumose apically, veins fuscous.

Mesonotum piceus with carinae more or less castaneous; inter-lateral area of vertex in part, the frons and clypeus sparingly, fusco piceus; pronotum, genae, the larger part of the frons (the base always) and clypeus, the margins of abdominal segments (narrowly) and the legs, all brightly or dully fulvous, depending on the example; tegulae sordidly fused flavo-testaceous. In the series examined the tendency is to bright yellow coloration in all the body parts, excepting the mesonotum, the smaller area of the frons, clypeus and abdomen, all of which latter are either piceus or dark fuscous.

The general structure of the aedeagus is much the same as in *hevahera,* excepting that the apical third of the periandrium is very much more elongate and curvate than in that species.

Female. Length, 10 to 11 mm.

Female much larger but structurally the same as the male, excepting that the lateral carinae of frons (seen in profile) appear to be less arcuate, the costa a little less arched and thickened at base and the fronto-clypeal area wider, with the base of frons somewhat tumescent. The difference between the sexes is mainly one of coloration, including, in particular, the tegmina and tegminal veins.

Tegmina clear hyaline, some examples being transversely suffused yellowish medianly, others also having the claval area wholly or partly similarly suffused; immaculate on basal two-thirds, excepting for one or more sparingly distributed light brown spots which, on most examples, are little if at all apparent. Examples which have the yellowish transverse suffusion give the tegmina, superficially, the appearance of being alternately pale and dark. Apical third irregularly banded or else more or less sparsely spotted light brown. Tegminal veins on basal two-thirds particolored fuscous and whitish or yellowish, excepting the costa, suture, cubital and radial, which are usually all fuscous. Beyond the base of Cl 1 + 2 fork the particoloration is sometimes darkly and more or less widely suffused fuscous. Veins on apical third all fuscous.

The coloration of the mesonotum, pronotum, vertex, frons, etc., is much darker than in the male, the variation, if any, leaning towards the dark. The mesonotal carinae in the examples studied are seldom castaneous, as is more often found in the opposite sex.

Hab. Oahu, in all the lower forest areas on both mountain ranges. Described from seventeen males and nine females from

various localities between 1916 and 1921, taken by Swezey, Timberlake, Bridwell, Giffard, Williams, and Bryan. Included in the above series are the following examples (without date) collected by Dr. Perkins some years ago, viz.: One male, Tantalus; one female, Waialua, 1500 feet, and one female, Nuuanu Pali, December.

Type, male, labelled Kuliouou, December 22, 1918, from Metrosideros sp. (Swezey).

Type, female, labelled Cooke trail, Nuuanu, October 15, 1916 (Timberlake).

Obs. Like *lanaiensis* this species is without doubt closely allied to *hevaheva*. The fairly large series studied indicates that it is very variable in size and coloration, and because of this the identity of specimens (the females in particular) may later prove perplexing. Notwithstanding these very apparent variations, I feel loath to separate any of them until further material of both sexes has been collected. Two of the larger male examples from Tantalus have the carinae of the apex of vertex obliquely converging from the lateral carinae, but very much less so than in the *kanakanus* group. All females examined, with one exception, have the position of the Cl f level or very near level with the Cu f. The exception is a Perkins Nuuanu Pali specimen which has the Cl f considerably below the Cu f. Such variations as this, however, occur in the venation of the tegmina of all the Hawaiian species or forms and, because of this fact, the position of the veins is of no specific value in our determinations. I have merely referred to the position of the veins in this particular species because it appears to be almost an exception to the rule.

Var. a.

There are three other females in the Oahu material studied which, for the present at least, I must refer to the above species. These have a dark fuliginous median transverse band on the basal two-thirds extending to the radius. It is quite possible that this pigmentation is merely a more highly colored representation of the yellowish transverse band referred to in the type series. With this exception, the structure and general coloration of these three specimens appear to be typical, but until a further series, including the males, is collected it is better to deal with them provisionally as varieties only.

Oahu. One female, Nuuanu Pali, November, 1904 (Swezey); one female, Kaumuohona, March, 1912 (Swezey), and one female, Manoa Valley, October, 1919 (Bryan).

Obs. These and smaller-sized female specimens from other islands have been mistaken for Kirkaldy's *orono* of Kauai because of the median transverse dark fuliginous band on the tegmina previously referred to.

28. **Oliarus mauiensis** sp. nov. Plate VII, Figs. 112, 113.

Male. Length, 9 mm.

Vertex much the same as in *olympus*. Width at base one and five-tenths times the width at apex; width at apex one and one-tenth times the width at origin of transverse carina; length one and nine-tenths times the width at base; apex truncate; transverse carina, about one-fourth from apex, curvate; fossette quadrate, anterior angles more or less tumescent, median longitudinal carina rudimentary.

Frons excavate; base of fork of medio-frontal carina short and wide, almost contiguous to the lateral carinae. Apical third of clypeus hardly excavate.

Tegmina immaculately dark yellowish hyaline on basal and middle thirds, except for a nebulous spot at apex of costal cell; apical third immaculate, fuliginous; costa fuscous, notably arched and much thickened at base. Stigma pale, with a fuscous spot at base. Tegminal veins pale yellow except on apical third, where they become dark fuscous. Wings yellowish basally, largely fuliginous apically; veins on basal third pale, and middle and apical thirds dark fuscous.

The aedeagus has affinities to both *olympus* and *lanaiensis*, the apical third of the periandrium being approximate to the former, although more excavate in the median area. The long basal spur of the phallus is similar to that of *lanaiensis*.

Fusco-piceus; mesonotal carinae castaneous; margins of frons, clypeus, vertex and the legs fulvous, and of the pronotum and tegulae very narrowly and sordidly flavous. The fulvous macula at lateral margins near base of clypeus large, very distinct, quite unlike the fused coloration of the clypeus in *oahuensis* or of the small and more or less indistinct macula in *lanaiensis*.

Hab. West Maui. A single male (the type) from the Waihee Valley, February 26, 1920 (Giffard).

Obs. This unique example is of more than ordinary interest as, unlike all the other *hevaheva* forms, it is quite free of picturation on the tegmina. It is, however, possible that with a

series the usual degree of variation in structure and coloration may be found.

29. **Oliarus haleakalae** Kirk. Plate V, Figs. 82, 83.

Male. Length, 9.25 mm.

Width of vertex at base one and five-tenths to one and six-tenths times the width at apex; width at apex one and two-tenths times the width at origin of transverse carina; length one and eight-tenths times the width at base; apex truncate; transverse carina one-third or more from apex, curved; fossette quadrate, deeply excavate anteriorly, without median longitudinal carina or, at most, with a very indistinct and obscure keel at middle of transverse carina.

Frons and clypeus deeply excavate; base of fork of medio-frontal carina curvate (sometimes slightly produced into the apex of vertex). In one example, the base of fork is somewhat obscure.

Tegmina dark yellowish or tawny hyaline, immaculate on basal two thirds, excepting for a fuscous spot near apex of claval and one at apex of costal cells; claval and sub-costal cells slightly yellow fuliginous; apical third with an irregularly curved dark fuscous band as in *hevahevа*. Tegminal veins, including suture, fusco-piceus; costal margins thickened, but not so "notably" arched at base. Stigma fusco-piceus. Wings largely fuliginous on outer margin apically.

Piceus; margins of vertex, frons, etc., sordidly flavescent; legs more or less fusco-testaceous; macula at lateral margins near fronto-clypeal suture large, distinct, more or less flavous. Except for the longer basal spur of the phallus, the aedeagus has nearer affinities to that of *olympus* than to other preceding species.

Hab. East Maui. Redescribed from three males, as follows: Two from Mount Haleakala (not dated), 2000 feet (Perkins), and one from Ditch Trail, east of Keanae, on Cyrtandra sp., July 31, 1919 (Timberlake).

Female. In the material before me there are three specimens from East Maui, two from Haleakala (Perkins) and one from Olinda, 1200 feet, June, 1918 (Giffard and Fullaway), which are more or less associated with this species. Due to variations in the structure of the apex of the vertex and the coloration and pattern of the tegmina in each, as well as to the paucity of specimens for study, I prefer, however, for the present, not to include them in this species. One of the examples from Haleakala has the typical structure of the apex of the vertex, but the basal two-thirds of the tegmina, in addition to the spot on the claval cell, has one or more maculae medianly and sub-apically between the cubitus and the radius, together with four more in the costal cell. The apical third is largely but very irregularly maculate. The other Haleakala female has the apex of the vertex sub-truncate, and the basal two-thirds of the tegmina immacu-

late except for two very faintly apparent spots in the costal cell, in addition to those in the claval and costal areas referred to in the male. Both the above have the tegminal veins dark fuscous, and their coloration in general is the same as in the other sex. The third example (from Olinda) varies still further in the structure of the apex of vertex and has striking particolorations of the tegminal veins on the basal two-thirds and remote and sparse maculae on the apical third. The claval and costal spots are, however, present in this specimen as in others of the species.

Obs. This species is represented in the British Museum by a male specimen from Haleakala, labelled as the type by Dr. Perkins. The brief tabulated description of *haleakalae* by Kirkaldy includes the "clavus with three black spots." The male examples determined by me as this species have no markings on the clavus other than the one noted in the above description. The species, like many of the others, is undoubtedly very variable, and, as Kirkaldy had but the one example, it is more than probable that it was an extreme case of maculation of the tegmina. The size, the truncate apex of vertex, the black mesonotal keels and the tegminal veins, together with the suffused yellow fuliginous markings of the tegmina, all agree with Kirkaldy's abbreviated description.

Due to the absence of the "notably arched" base of the costa of the tegmen, this species, with one or more others, will have to pass as an "intermediate" between the *hevaheva* and the *kanakanus* groups.

Until more material is secured from the islands of Maui and Molokai, the females referred to cannot positively be determined as *haleakalae*. The two specimens from Haleakala may possibly be that species, but I suspect that the one from Olinda belongs to quite another species, males for which are at present wanting.

30. **Oliarus montanus** sp. nov. Plate V, Figs. 86, 87; Plate VIII, Fig. 125.

Male. Length, 7 mm.

Width of vertex at base one and four-tenths times the width at apex; width at apex one and one-tenth times the width at origin of transverse carina; length twice the width at base; apex slightly curved (carinae more or less obscured, due to a slight tumescence at angles); transverse carina one-fourth from apex, curvate or else sub-truncate (variable); fossette quadrate-rotundate, excavate anteriorly without median longitudinal carina or, at most, with a slight tumescence at middle of transverse carina.

Frons and clypeus very moderately excavate; base of fork of medio-frontal carina level with apical carinae of vertex, not produced beyond.

Tegmina yellowish hyaline, immaculate on basal two-thirds, except for a fuscous area along the inner basal margin of clavus; costal cell without the dark macula at apex, which is so noticeable in all the *hevaheva* and *kanakanus* group species; on the apical third a more or less large and irregular fuscous spot appears to be always present in the Cu and Sc cells, but between these, medianly, the cells may be either sparsely spotted or without spots, or else the cross veins may be or may not be largely suffused with same color. Costal margin arched (not as notably as in *hevaheva*) and much thickened at base. Stigma pallid internally, with a fuscous spot near base. With the exception of the media, radial, a part of the cubital, which are all more or less light brown, all the tegminal veins on the basal two-thirds are pallid; the apical third and the costa are all dark fuscous. Tubercles very distinct, brownish. Wings fuliginous or else fumose apically.

Piceus; pronotum and tegulae fusco-piceus; margins of the frons, clypeus, vertex, pronotum, etc., narrowly ochraceous; legs flavo-testaceous; a minute yellowish spot at lateral margins near fronto-clypeal suture (not always present).

Female. Length, 9 mm.

Structurally, like the male, but of a darker color. Tegmina clear hyaline sparingly suffused yellowish in spots, immaculate on basal two-thirds, except for the fuscous area seen in the male near base of claval area. Tegminal veins (except suture) particolored pale and dark on basal two-thirds, the dark particoloration in the middle third being more or less suffused; apical third maculated as in the male, with all the veins dark fuscous.

Coloration of the body parts much darker than in the opposite sex.

Hab. Kauai, in the mountains at high elevations back of Makaweli and the Waimea regions. One male, Olokele Canyon, September, 1920 (Swezey); two males and one female, Kalalau, June, 1922 (Bryan).

The type, male, is labelled Olokele Canyon, Kauai, September 5, 1920 (Swezey).

The type, female, labelled Kalalau, Kauai, June 19, 1922 (Bryan).

Obs. This appears to be another "intermediate" form partaking more of the "*hevaheva*" than the "*kanakanus*" group. The characters of the tegmina are closely allied to the former, while the fossette and aedeagus indicate closer affinities to the latter.

31. **Oliarus kanakanus** Kirk. Plate VII, Figs. 114, 115.

Male. Length, 8 to 8.75 mm.

Width of vertex at base one and three-tenths to one and four-tenths times the width at apex; width at apex one and one-tenth times the width at origin of transverse carina; length one and seven-tenths to one and nine-tenths times the width at base; carinae of apex obliquely converging from lateral margins of the fossette; transverse carina, about one-fourth from apex, sub-angulate or curvate (variable); fossette sub-quadrate-rotundate, mostly wider than long, excavate near anterior and side margins, more or less tumescent at anterior angles and without median longitudinal carina, or at most a slight tumescence at middle of transverse carina.

Frons and clypeus moderately excavate; base of fork of fronto-median carina very slightly produced beyond the carinae of apex of vertex, more or less curvate or else impressed or slightly obscure.

Tegmina yellowish hyaline or else spotted yellowish fuliginous, two and eight-tenths times longer than wide at the middle, costal margin not notably arched nor thickened at base, basal two-thirds immaculate, or, if at all maculate the Cl 1 + 2 has two or more fuliginous spots and a like number fused into costal margin, these latter sometimes little apparent. In lieu of the claval spots, one of the examples has all that area darkly pigmented. Apex of the costal cell always darkly spotted. Stigma and costa dark to light fuscous; apical third always more or less maculate with either large dark and irregular maculae or else with more or less sparsely distributed spots. Tegminal veins on basal two-thirds variable, more or less particolored fusco-piceus or fuscous with occasional pallid interruptions, these latter more evident (when at all present) on the basal third, the apex of the suture and the Sc; veins on apical third dark fuscous, except for pale particolorations on the Cu and Sc; cross veins more or less suffused. Wings more or less fuliginous apically.

Fusco-piceus, legs fuscous or fusco-testaceous; margins of pronotum, tegulae, base of frons narrowly, genae more or less, and intero-lateral margins of vertex more or less widely flavid; carinae of frons narrowly light castaneous; macula on lateral margins near fronto-clypeal suture large, fulvous.

Several dissections of the genital organs of extreme varieties present no differences, the aedeagus being alike in all. There appears to be a closer affinity to *montanus* in the general structure of the aedeagus than to *haleakalae*. Both of these latter species are intermediate forms between the *hevaheva* and *kanakanus* groups.

Female. Length, 10 mm.

Except in size and in the pattern of the tegmina, the characters and general coloration of the female are much the same as those of the male.

Tegmina variable, largely banded and spotted yellow fuliginous and with more or less sparsely distributed milky hyaline spots; largely pigmented light fuscous basally, or with two or more distinct and dark maculae in claval area; apical third largely and irregularly maculate, the extreme

apical veins particolored or pallid as in the male; tegminal veins fuscopiceus largely interrupted on the basal two-thirds by more or less long pallid particolorations; cross veins suffused fuscous; costal margins alternately particolored pale and dark, but variable, sometimes all fuscous.

Hab. Hawaii, region of Kilauea, near volcano, and in Olaa and Hilo districts. Redescribed from six males and four females as follows: Five males and three females, Kilauea and upper Olaa, June-August, 1918 (Giffard), and one male, Kamana (back of Hilo), March, 1918, and one female, Kilauea, June, 1917 (Swezey).

Var. a.

Male. Length, 7 mm.

Structurally like the preceding, except as to the following: Width of vertex at apex same as the width at origin of transverse carina; length two and one-tenth times the width at base; fossette quadrate.

Tegmina hyaline, largely suffused and spotted yellow fuliginous; basal two-thirds immaculate, except for spot at apex of costal cell; apical third irregularly maculate much as in some typical examples of *kanakanus*. Tegminal veins mostly pallid, with sparse dark-brown particolorations on basal half and more largely of the latter color on the sub-apical area; apical third in part pallid; cross veins slightly suffused; costa light fuscous, the margin showing darker suffused particolorations; stigma pale fuscous. Wings largely and darkly fuliginous apically.

Aedeagus of the same form and structure as *kanakanus*.

Hab. Hawaii: Lower forest zone in Puna, 750 feet elevation, two males, August, 1918 (Giffard).

Obs. This is a very variable species which in certain respects has a superficial resemblance to some of the *hevaheva* group, but is well separated, not only by the much less arched and less thickened base of the costal margin, but also by the structure of the apex and fossette of vertex. The structure of the aedeagus further separates it from *hevaheva* forms and passes it on to another group which, for convenience, I have called the "*kanakanus* group." It will be found, however, that the general structure of the aedeagus of *kahavalu* Kirk. and of *kulanus* sp. nov., both of which also belong to this section, has closer affinities (notwithstanding the absence of the right apical spur of the phallus) to those of the *hevaheva* forms, and that in consequence one of these should, perhaps, take hereditary precedence

to *kanakanus* as a group name. Because of this the question may arise why *kanakanus* and its close allies should be grouped under that name rather than that of *kahavalu*. I can only explain this because of sentimental reasons arising from the fact that *kanakanus* was the first and only species of this particular group described by the late G. W. Kirkaldy in his first paper on the Hawaiian Cixiidae,[1] while *kahavalu* (another of his species) was not described until years later,[2] and then only in his abbreviated tables.

The principal variations in *kanakanus* are in the pattern of the tegmina and in the coloration of the tegminal veins. Similar variations, however, will be found in all our maculate forms, more particularly so in the females. Kirkaldy, in his tabular description (not in Fauna Haw.) of this species, refers to "a narrow median transverse stripe" on the tegmina of a female from Oahu, but it is quite probable that the male of this, when collected on Oahu, will have other characters which will better distinguish it from *kanakanus* of Hawaii. This Oahu female referred to by Kirkaldy apparently is not in the type collection of the British Museum, and it is certainly not included in his Honolulu material. These remarks as to the dimorphic features of this species are stressed because of material in my hands consisting of a fair series of females (from Oahu) belonging to this division (fossette without median carina) with which I cannot at present associate males nearer than *kaohinani*, an Oahu species without any such median transverse stripe on the tegmen, but which, like *kanakanus* (to which it is related), is itself one of the most variable species of all. It is, therefore, quite possible that the Kirkaldy Oahu female example and the other Oahu specimens of the series above referred to are extreme varieties of *kaohinani* and, therefore, should not, because of the transverse coloring only, be determined as *kanakanus*.

The example of *kanakanus* in the British Museum, marked as the "type" by Kirkaldy, is a female labelled No. 656 (i. e., Kilauea, Haw., August, 1896). If his description in Fauna Haw. is carefully followed it will be evident that he used mainly, if

[1] Fauna Haw., Vol. III, Part 2, December, 1902, p. 121 (Hemiptera).

[2] Pro. Haw. Ent. Soc., II, No. 2, September, 1909, p. 77.

not altogether, the characters and coloration of the female in preference to those of any male which he may have had at the time. No males were found in his material in either museum. A badly damaged male (without the tegmina) from Molokai, and a female from Oahu, had been referred to this species in the Honolulu material, but both are lacking in certain dominant external and genital characters of the type. The dissection of the aedeagus of this damaged male places it as *kahavalu* of Molokai. The "fragment" from Molokai referred to by Kirkaldy, and included by him in his tables, is no doubt the same specimen.

32. **Oliarus kahavalu** Kirk. Plate VII, Figs. 116, 117.

Male. Length, 8 mm.

Closely related to *kanakanus* of Hawaii. It may be separated from that species by the color and pattern of the tegmina, which is more hyaline and more maculate; by the fossette of vertex, which is a trifle longer than wide, and by the median longitudinal carina of the fossette, which is more developed, but by no means complete.

Tegmina mostly clear hyaline, the corium spotted, and the clavus all yellow fuliginous; three or more fuscous maculae on the claval area, one at apex of costal, and another near the forks of the median cells; cross veins all largely suffused fuscous; apical third more or less sparsely and irregularly maculate. Tegminal veins particolored whitish and fuscous on basal half, becoming all dark apically except for faint pallid particolorations in the Cu 1 and Cu 1b area. Costal margins at base similar to those of *kanakanus*, middle third more or less particolored with suffused light and dark fuscous spots. Stigma light fuscous. Wings narrowly fuliginous apically.

(*Maui* var.). Piceus; legs dark fuscous; margins of intero-lateral area of vertex, pronotum and tegulae sordidly flavid.

(*Molokai* var.). Fusco-piceus; legs fusco-testaceous; margins of intero-lateral area of vertex, pronotum, frons, etc., more or less fulvous. Macula at lateral margins of fronto-clypeal suture fulvous and of medium size.

The aedeagus approaches nearer that of *haleakalae* than that of *kanakanus*, but differs from both by the total absence of the long left spur at the apex of the phallus.

Hab. Maui and Molokai. Redescribed from one male, Wailuku, West Maui, September, 1919 (Williams), and from one male (without tegmina) from the Kirkaldy material, No. 589 (Molokai, 4000 feet, June, 1896, Perkins).

Obs. This species was very briefly described by Kirkaldy in

his tables and associated by him with *kanakanus* on the basis of tegminal coloration of a male (?) from Molokai. No specimen of that sex, however, is in the collection of the British Museum, the only representative of *kahavalu* being a female which is not labelled as the type by Kirkaldy. In the Bishop Museum (Kirkaldy material) there is a mutilated male (No. 589) specimen from Molokai (included in above description) which had been determined as *kanakanus*. I believe this to be the Molokai "fragment" referred to by Kirkaldy when he tabulated the latter species. Although the tegmina are off, the external structures and the aedeagus are the same as the Wailuku example, which latter I have used (in part) for redescribing *kahavalu*. There is a variation in the coloration of the body structures, but not any more so than one might expect to find in examples of the same species from two islands so close to each other as Molokai and Maui. Referring to the maculae on the tegmina of the single example before me, it may be expected that additional material from these two islands may vary more or less as to pattern and position, as is sometimes the case with other species, more particularly if the specimens have been collected in remote regions. In the material before me there is a single female labelled from Haleakala, April, 1920 (Forbes), which I rather hesitate to associate with this species without further material. The external structures place it in the "*kanakanus* group," but the maculated tegmina and coloration are somewhat too remote from the male to make a positive determination.

33. **Oliarus kulanus** sp. nov. Plate I, Fig. 6; Plate VII, Figs. 118, 122.

Male. Length, 10 mm.

Width of vertex at base one and five-tenths times the width at apex; width at apex about equal to the width at origin of transverse carina; length one and eight-tenths times the width at base; carinae of apex obliquely converging and coalescent with lateral carinae of fork of frontomedian carina; transverse carina, about one-fifth from apex, sub-truncate; fossette complete, quadrate, one and two-tenths times wider than long, excavate (much more so anteriorly) and without tumescence or visible sign of the rudimentary median longitudinal carina at middle of transverse carina as seen in preceding species; lateral carinae viewed in profile straightly produced from origin of transverse carina to two-thirds of their length, posterior third curvate.

Clypeus very moderately and frons deeply excavate. In profile the lateral carinae of frons sinuate; carinae of fork of fronto-median carina diverging and continuous with carinae of apex of vertex, forming no base to the fork; base of frons slightly tumescent, contiguous to lateral carinae of fork.

Tegmina clear hyaline, fuliginous at base, otherwise remotely spotted yellowish, two and six-tenths times longer than wide at middle, costal margin not "notably" arched nor thickened at base; basal two-thirds maculate, a blotch at apex of basal cell and base of Cu, and three spots on claval area, dark fuscous; costal cells with the usual macula at apex and two or more (more or less distinct) light fuscous spots fused into costal margin near middle, making it appear particolored; apical third sparsely and remotely maculate. All cross veins more or less suffused dark fuscous. Tegminal veins on basal two-thirds all largely particolored yellowish-white with dark fuscous; veins on apical third all dark fuscous, with the exception of those at extreme apex of Cu 1 to Cu 1b, which are pallid. Stigma dark. Wings narrowly fuscous apically.

Coloration of body structures much the same as in the preceding. The structure of the aedeagus very similar to that of *kahavalu*.

Female. Length, 11.5 to 12 mm.

Including the structure of the fossette, carinae of apex of vertex and the fork of fronto-median carina, the female is much the same as the male. One example has the base of the fork obscure, not quite obsolete. The lateral margins of the vertex viewed in profile are sub-arcuate instead of straight, as in the male.

With the exception that the margins of the pronotum, tegulae, frons, etc., are much more conspicuously flavid, the macula at lateral margins of fronto-clypeal suture larger and distinctly fulvous, and the hind margins of the mesonotum narrowly fulvous, the coloration of the female is the same as that of the male. Tegmina clear hyaline, fuliginous at base, banded and spotted yellowish fuliginous at middle and apical thirds. Color of tegminal veins and position of the maculae much the same as in the opposite sex. Cross veins suffused, except those on basal two-thirds.

Hab. East Maui, at an elevation of 5000 to 5300 feet on the slopes of Mount Haleakala. One male (the type) and three females, July, 1919 (Timberlake).

Obs. This species is closely allied to *kahavalu*, but the difference in size, the shape of the fossette, the lateral margins of the frons, viewed in profile, etc., will easily separate it from that species. There are one or more species peculiar to Kauai, belonging mostly to other groups, which have a very similar structure of the frontal fork and apex of vertex, but in these the base of fork is generally obscure, seldom obsolete. It is quite possible

that in a series both sexes may vary in this particular character, as it appears to be by no means either absolutely constant or reliable.

34. **Oliarus kaohinani** Kirk. Plate VII, Figs. 119, 120.

Male. Length, 7 to 8 mm.

A very variable species, in a measure allied to *kahavalu*. It may, in part, be separated from the latter species by the structure of the fossette of vertex, the castaneous mesonotal carinae, the less maculate tegmina, the more particolored tegminal veins, and the generally lighter colorations of all the carinae and of the legs.

The following variations will be found in this species, viz.: Vertex more or less wide; transverse carina of vertex curvate or sub-angulate; fork of medio-frontal carina sometimes impressed or obscure at base; angles at base of frons appearing more or less tumescent, but at most never obscuring the carinae of apex of vertex; fossette always wider than long, but quite variable as to width, more or less tumid medianly, with the tumescence sometimes extending halfway to the anterior margin, but never forming a complete median longitudinal carina; carinae of apex of vertex more or less obliquely converging from the lateral margins, as in its allies.

Tegmina clear hyaline, more or less banded and spotted yellowish fuliginous, always largely so on claval area, in particular; more or less sparingly maculate on basal two-thirds, often with three fuscous maculae on claval area and a spot at apex of costal cell (sometimes these are hardly apparent or else quite absent); rarely the maculae on clavus may be found to be fused, forming, as it were, a longitudinal band, and the costal cell may be very sparingly and very lightly spotted, or else all the basal two-thirds may be quite immaculate. Stigma light or dark fuscous, sometimes in part whitish internally. Base of costa structurally the same as in its close allies, excepting that the thickened portion appears to be less distinct. Apical third more or less sparsely and remotely maculate, sometimes with the maculae hardly apparent.

Tegminal veins all more or less particolored fuscous and whitish or yellowish; cross veins suffused; costal margins alternately pale and dark.

Wings more or less narrowly fuliginous apically, veins mostly fuscous.

Dark fuscous or fusco-piceus, mesonotal carinae castaneous; carinae of vertex, frons and clypeus more or less fulvous or ochraceous; basal angles of frons more or less fulvous; margins of pronotum and tegulae stramineous; maculae near lateral margins of fronto-clypeal suture fulvous, variable in shape, but always large; legs flavo- to fusco-testaceous.

The aedeagus in general has close affinities to that of *kahavalu*, but differs particularly, as follows: The inner margin of the apical third of the periandrium is more sinuate, and the single apical spur of the apex of the phallus is very much shorter.

Var.

Male. Length, 8 mm.

This variety has the right median spur of the phallus shorter and curvate, with a very rudimentary left spur or spine at the apex; the projection on the ventral surface of the periandrium, viewed laterally, is also larger than in the preceding; with these exceptions in the genital organs, there are apparently no constant characters to differentiate it from the type form above described.

Female. Length, 9 to 10 mm.

The females, like the males, are very variable in size and as to the pattern of the tegmina. The tegmina may either be almost or quite immaculate or else, more commonly, the pigmentation may follow that of most of the males, excepting that an additional macula may or may not be present in the sub-apical area near the forks of the media. The tegminal veins are more interrupted with dark and pallid particolorations, and the cross veins more largely suffused fuscous than in the male. The colorations of the mesonotum, frons, etc., are in general darker than in the latter sex. The castaneous mesonotal carinae and the pallid venation of parts of the apical third of the tegmina are, however, constant in both sexes and in all examples.

Hab. Oahu: On all mountain ranges and at various elevations from 1500 to 4000 feet. Redescribed from twenty-four males and twelve females from the following localities:

Varieties with tegmina almost immaculate.

Males. Length, 7.5 to 8 mm.

One male, labelled No. 885, Honolulu Mountains, September, and one female, No. 762, Waialua, March, 1901 (Perkins), from the Kirkaldy material in Bishop Museum.

One male, Waialua Mountains—not dated—(Perkins); one male, Alewa Heights, March, 1916 (Timberlake): one male, Lanihuli, October, 1919 (Williams); one male, Kalihi Ridge, Ap. 1920 (Bryan); one female, Kaumuohona (Muir): one female, Opaeula, March, 1913 (Swezey).

Males. Length, 7 mm.

One male, Makaleha Valley, December, 1919 (Swezey): one male, Tantalus, December, 1915 (Giffard).

Varieties with tegmina maculate.

Males. Length, 8 mm.

Seven males, Kalihi, Olympus, Mount Kaala, Lanihuli, and

Palolo, 1914-1920 (Swezey, Timberlake, Bridwell, and Bryan), seven females, Olympus, Palolo, Nuuanu, Waialua, Waianae, and Kuliouou, 1913-1920 (Perkins, Swezey, Timberlake, Fullaway, and Bryan).

Males. Length, 7 mm.

Ten males and two females, Tantalus, Mount Kaala, Waianae, Kuliouou, Malamalama, 1906-1920 (Giffard, Swezey, Timberlake, and Bridwell).

Obs. The supposed type of this species in the British Museum is a male from the "Hon. Mts.," labelled by Kirkaldy in pencil with the manuscript name "*Kaiulani.*" As with other of his tabulated species which were not described by him in the "Fauna Hawaiiensis," a specimen from his material was selected after his death as the type—in this instance the example above mentioned. A similar male and a female from the same locality—but not bearing any manuscript name—were retained by the Bishop Museum as a co-type. Both of these latter examples agree with the rest of the series above described. Although Kirkaldy's tabulated description is quite inadequate and somewhat misleading, it is obvious that the large series of both sexes before me refer to this maculate species. Any discrepancy as to size or other measurement as between his description of the male and those included in the above series can be attributed to the fact that he had but three or four specimens at most to study and, in consequence, had little opportunity, if any, to judge of the extreme and intermediate variations which occur in examples from various, and sometimes remote, localities on the island. It appears strange, however, that he omitted to note in his brief description the castaneous coloration of the mesonotal carinae, which in this species appears to be a constant character. His description of the female is that of a totally different species belonging to one of the "Divisions," which has the fossette completely divided by a median carina. The males of this latter species have the tegmina immaculate, while those of *kaohinani* are maculate as described by him. The females of both species have the tegmina more or less maculate, but are easily separated one from the other by the character of the fossette and of the basal angles of frons, as well as by the width of the vertex, which in *kaohinani* is wide and in the other very narrow.

The extreme and intermediate variations in *kaohinani*, as previously referred to, have heretofore caused much confusion in determination. In the circumstances it would be unwise to split these variations into species or sub-species, even though in some isolated examples there may be found a minor difference in the structure of some part of the aedeagus.

35. **Oliarus intermedius** sp. nov. Plate VII, Figs. 121, 126.

Male. Length, 8 mm.

Width of vertex at base one and two-tenths times the width at apex; width at apex one and one-tenth times the width at origin of transverse carina; length twice the width at base; carinae of apex hardly, if at all, apparent, confluent with tumescent area at base of frons; transverse carina, about one-fourth from apex, subtruncate; fossette quadrate-rotundate, wider than long, deeply excavate anteriorly, with the posterior margin swollen, the median longitudinal carina appearing more or less produced from middle of transverse carina and very faintly and narrowly furcate, but by no means forming a complete division. Frons and clypeus slightly excavate; basal angles of frons more or less tumescent.

Tegmina milky hyaline, banded and spotted yellowish fuliginous, largely so in claval and sub-apical area; very sparingly when at all maculate on the basal two-thirds, the light fuscous maculae, if present, being either at apex of clavus or (hardly apparent) fused into margin of costa; apical third sparsely, remotely and irregularly spotted light fuscous. Tegminal veins largely particolored light fuscous and whitish on basal third, less so and darker on middle and apical thirds; costa alternately pale and dark; cross veins on apical third suffused; stigma dark fuscous, pallid at base. Wings narrowly fuliginous apically, veins dark fuscous.

Colorations much as in *kaohinani*, except that the mesonotal carinae are fusco-piceus and not castaneous.

The aedeagus differs from its close allies principally by the much longer and sharper spurs at apex of the phallus and the somewhat different structure of the apical third of the periandrium. The latter character, however, is variable within the species.

Hab. Kauai. One male, Kaholuamano, April, 1920 (Kusche), and one male, Summit Camp, April, 1922 (Swezey); one female from the Kirkaldy material labelled 640 (i. e., High Plateau, Kauai, July, 1896, Perkins).

The male type is the specimen labelled Kaholuamano.

Obs. This species is closely allied to but quite distinct from *kaohinani*. Of the two males referred to, both have slight differences in the coloration and pattern of the tegmina, as well as

in the aedeagus. I have no doubt but that a large series collected from various localities on Kauai would present further variations. The single female above referred to has the median longitudinal carina of the fossette more developed than in the male, and the tegmina are much more maculate basally and apically.

36. **Oliarus consimilis** sp. nov. Plate VII, Figs. 123, 124.

Male. Length, 7 mm.

Very similar in structure and coloration to *intermedius*, but distinguished by the less tumescent basal angles of the frons, the visible obliquely converging carinae of the apex of the vertex, the less excavate fossette, the more apparent and darker maculation of the basal two-thirds, and the less particolored apical third of the tegmina.

It may further be distinguished by a dissection of the aedeagus, the apical third of the periandrium of which is quite different in structure from its close relative (see figure).

Female. Length, 9 mm.

With the exception of the pattern of the tegmina the female is similar to the male in structure and coloration. Tegmina milky hyaline; the clavus, a transverse band at the middle and a large spot in the sub-apical area yellowish fuliginous; basal two-thirds maculate, a suffused area at extreme base, a macula at apex of clavus, two or more in costal area, and a large and very irregular area in the region of the forks of the media and radial cells extending to the apical third, all dark fuscous; apical third irregularly but largely maculate. Tegminal veins on basal two-thirds particolored dark fuscous and whitish; on apical third the veins are mostly dark with slight whitish particolorations near extreme apex. Wings in both sexes completely hyaline, except for a very narrow fumose apical margin; veins dark fuscous.

Hab. Kauai, in the lower forest above Lihue, at 800 feet elevation, four males and one female, May 13, 1923 (Swezey).

37. **Oliarus kauaiensis** Kirk. Plate VI, Figs. 90, 91.

Male. Length, 5.5 mm.

Width of vertex at base one and three-tenths to one and four-tenths times the width at apex; width at apex a little more than the width at origin of transverse carina; length one and six-tenths times the width at base; carinae of apex sub-curvate; transverse carina, about one-fourth from apex, curved; fossette sub-quadrate-rotundate, wider than long, deeply excavate anteriorly, posterior margin swollen, with the median longitudinal carina more or less developed, but never forming a complete division.

Frons and clypeus very moderately excavate, carinae and suture distinct, median ocellus obscure; basal angles of frons very slightly (sometimes not

at all) tumescent; base of fork of medio-frontal carina more or less impressed and very slightly produced beyond carinae of the apex. Fore tibiae short.

Tegmina more or less milky hyaline, with the basal third darkly fumose, a nebulose (sometimes light fuscous) transverse band at middle third, and one or more similar spots in the costal cell; apical third very sparingly and remotely, if at all, spotted. Tegminal veins on the basal two-thirds pale and dark (not particolored); apical third and the costa all dark fuscous; cross veins more or less suffused; stigma dark fuscous, pallid at base; granules brownish, moderately distinct. Wings clear hyaline, veins light to dark fuscous.

Aedeagus with the median right spur of the phallus short and curved and both apical spurs stout and of medium length.

Piceus; carinae of vertex narrowly and of frons more widely ochraceous or flavo-testaceous, the coloration of lateral carinae above and below fronto-clypeal suture widening out (wedge-shaped) without forming the macula usually present in other species; carinae of pronotum and tegulae stramineous; legs fusco-testaceous.

Female. Length, 6 mm.

With the exception of the pattern of the tegmina, the structure and coloration of the female are the same as those of the male. Tegmina slightly milky hyaline, more or less diffused yellowish fuliginous at the base, a similar band transversely at middle and more or less spotted the same sub-apically; tegminal veins on basal two-thirds, including the costa, mostly pale but somewhat darker at base, in the middle and on all of the apical third; cross veins more or less suffused; granules brownish, very distinct.

Hab. Kauai, in the lower forest zone, at 800 feet. Redescribed from seven males and four males, Lihue, May 13, 1923 (Swezey).

Obs. Kirkaldy has a very inadequate description of a female in his tables, but does not refer to the male. The species is not represented in the British Museum collections, nor were there any specimens in the balance of the Kirkaldy material at the Bishop Museum, Honolulu. A male and female from the above series have been selected as "lectotypes" of the species.

Among both males and females there is a tendency towards immaculacy, which fact will account for variations in the pattern and coloration of the tegmina.

38. **Oliarus waialeale** sp. nov. Plate VI, Figs. 92, 93.

Male. Length, 6 mm.

A variable species, but in general structurally similar to *kauaiensis* except for the broader tegmina, a somewhat wider vertex and a slight difference in the character of the fossette, which in some examples is shorter and less excavate, having the tumid area at middle of the posterior margin, together with the more or less produced median longitudinal carina, either obsolete or obscure.

Tegmina hyaline, broader and less elongate than in *kauaiensis*, more or less yellowish fuliginous and sparingly or faintly spotted light fuscous in the costal area. (In some examples these spots are hardly, if at all, apparent.) Tegminal veins more or less particolored testaceous and fuscous on the basal two-thirds (appearing alternately pale and dark); costa testaceous or fuscous, variable; granules very distinct.

The aedeagus differs from *kauaiensis* in the right median spur of the phallus, which is longer and stouter, and in the apical third of the periandrium, which is much more elongate.

Female. Length, 6.5 mm.

The two female examples before me appear to be very similar to the male in structure and coloration.

Hab. Kauai, on the mountains back of Waimea. One male, Waialeale trail, May, 1920, and one male, near Waialae River, January, 1920 (Kusche); three males and two females, Kokee, July, 1922 (Fullaway).

Type, male, labelled Waialeale trail, 5000 feet, May, 1920 (Kusche).

Type, female, labelled Kokee, July, 1922 (Fullaway).

Obs. This species, like its close relative (*kauaiensis*), is very variable, particularly as to the pattern of the tegmina and coloration of the tegminal veins. In the collection there is a female labelled "near Waialae River, March 29, 1920 (Kusche)," with a much darker pattern of the tegmina and veins which may possibly be refered to this species.

39. **Oliarus lihue** sp. nov. Plate VI, Figs. 94, 95.

Male. Length, 6.5 mm.

Width of vertex at base one and four-tenths times the width at apex: width at apex one and one-tenth times the width at origin of transverse carina; length one and six-tenths times the width at base; carinae of apex truncate, but appearing deflected or decurved in certain aspects, more or less obscure because of its coalescence with the tumescent area of the

anterior angles of the fossette and the basal angles of the frons; transverse carina, about one-third from apex, truncate; fossette complete, quadrate, very little wider than long, moderately excavate, anterior angles largely tumescent, giving that area a rotundate appearance; median longitudinal carina obsolete.

Frons and clypeus moderately excavate; basal angles of frons slightly tumescent; base of fork of medio-frontal carina impressed. Fore tibiae moderately short.

Tegmina hyaline, largely fuliginous on basal third and with fuscous maculae close to inner margin on apical third. Tegminal veins on basal two-thirds and the costa flavo-testaceous, apical third dark fuscous; cross veins lightly suffused; stigma dark fuscous, pallid basally. Wings clear hyaline, veins dark fuscous.

Piceus; carinae of vertex narrowly, the lateral margins at apex of frons and base of clypeus (macula absent) more widely, flavo-testaceous; pronotum (sordidly) and tegulae largely stramineous; legs testaceous.

Female. Length, 7 mm.

The female differs from the male, as follows: Fossette as wide as long, quadrate-rotundate, slightly tumescent posteriorly with the median longitudinal carina rudimentary; carinae of apex of vertex obliquely converging from lateral margins of fossette; transverse carina curvate.

Tegmina hyaline with the basal third all dark fuliginous and contiguous to same, an irrregular and wide transverse dark fuscous band medianly; two or more darkish maculae in the costal cell, and the apical third with a wide and irregularly curved dark fuscous band following the sub-apical margin. Tegminal veins on basal two-thirds in part pale, and on apical third all dark fuscous; costa light fuscous; cross veins largely suffused and stigma dark fuscous. Wings clear hyaline, narrowly fumate apically, veins dark fuscous.

Hab. Kauai, in the lower forest zone, at 800 feet elevation. One male and one female (the types), Lihue, May 13, 1923 (Swezey).

Obs. Superficially, this species has somewhat the general appearance of some in the *tarai-morai* group, but the extreme difference in the character of the aedeagus places it elsewhere. The female, although taken at the same time and in the same place as the male, is suspiciously this species, the uncertainty being due principally to the difference in the structure of the vertex. Other characters associating it with the male have led me to refer it to this species until a larger series of the latter can be obtained.

40. **Oliarus opuna** Kirk. Plate I, Fig. 10.

Male. Length, 5 to 6 mm.

Width of vertex at base one and one-tenth to one and two-tenths times the width at apex; width at apex slightly more than width at origin of transverse carina; length one and five-tenths to one and six-tenths times the width at base; carinae of apex thickened, curved or else obliquely converging from lateral margins of fossette; transverse carina, about one-fourth from apex, truncate; fossette transverse, two and one-half times (somewhat more or less) wider than long, moderately excavate, the thickened carinae of apex giving it a rotundate appearance anteriorly, without median longitudinal carina.

Frons and clypeus moderately excavate; medio-frontal carina distinct with the base of the fork straight and more or less impressed; fronto-clypeal suture distinctly forming a ridge or keel almost straightly converging from the lateral margins of the frons to the median ocellus, which latter is more or less indistinct, due to the tumescent carina at the junction.

Viewed in profile the upper part of genae, between anterior margins of eyes and fossette, moderately lengthened, with the lateral carinae of frons and of the vertex sub arcuate.

Tibiae and tarsi unusually short.

Tegmina clear to milky hyaline, maculate; basal third largely, a narrow and irregular transverse band at the middle (sometimes interrupted), a slightly undulate band from stigma to apex of clavus and two or more spots in the costal area, fuscous; tegminal veins on basal two-thirds pale sordid flavous; costal margins more or less suffused fuscous; veins on apical third light fuscous; cross veins nebulose or suffused fuscous; granules dark, distinct; stigma dark fuscous. Wings pale milky hyaline; veins light fuscous.

The aedeagus of the male is conspicuously different from all other groups, not only in the apical third of the periandrium, but also because of the addition to the left margin of the phallus, medianly, of a long, stout, and curved spur. The apical third of the phallus also differs in structure from other groups.

Fusco-piceus; mesonotal carinae castaneous; margins of pronotum and carinae of vertex and frons narrowly flavous; tegulae largely pale stramineous; macula at lateral margins near fronto-clypeal suture more or less indistinct. Legs more or less fusco-testaceous.

Female. Length, 6.25 mm.

The female is very similar to the male in structure and in the pattern of the tegmina, excepting that the fossette is wider, the tibiae and tarsi a little longer, and the maculae on the tegmina in general darker. The color of the mesonotum, frons, etc., and of the legs is somewhat variable, the former ranging from fusco-piceus to piceus, and the latter more pallid

than in the male. The margins of the pronotum, vertex, etc., also appear more flavid than in the latter sex.

Hab. Hawaii. Redescribed from four males and five females, as follows: Two females (paratypes) labelled 656 (Kilauea, Hawaii, August, 1896, Perkins); three males and one female, Kilauea, July, 1906, from *Astelia* sp. (Perkins); one male, Kilauea, August 5, 1919, from *Coprosma* sp. (Swezey): one female, August 2, 1919, from *Dubautia* sp. (Swezey), and one female, Kilauea, from *Nephrolepis exaltata* in steam fissure on lava flow close to crater, August 25, 1919 (Giffard).

Obs. It appears evident that when Kirkaldy wrote his description of this species in the Fauna Haw. he had no male specimens in his material. Both his description and the figure are from a female, and his later tables did not include the male. The only specimen in the British Museum is a female which is marked "type" by Kirkaldy, and it and the two female paratypes in the Bishop Museum are labelled No. 656 (i. e., Kilauea, Hawaii, August, 1896, Perkins). All the males and the other females in the material before me have since been collected by Dr. Perkins and others.

The quite different structure of the aedeagus, the unusual width of the fossette and other characters of the vertex, together with the shortness of the fore tibiae and tarsi, easily separate this and the following three species (all closely allied) from all other groups in this division.

41. **Oliarus euphorbiae** sp. nov. Plate II, Fig. 16; Plate VI, Fig. 102.

Male. Length, 5 to 5.5 mm.

Very like the preceding in general appearance and equally variable in the dimensions of the vertex, etc. It differs mostly in certain of the characters of the aedeagus and in the pattern of the tegmina.

Tegmina clear to milky hyaline, basal third immaculate; very light or faint fuscous spots more or less sparingly scattered on the middle and apical thirds, very rarely with an uninterrupted median transverse band and never with an apical undulate band between the stigma and apex of the clavus as in *opuna*; costal cell always spotted, the spots detached and not fused into the costal margin. Tegminal veins light flavous, slightly darker toward extreme apex; cross veins on apical third largely suffused or nebulose; granules dark fuscous and very distinct; stigma pale fuscous. Wings hyaline, veins light fuscous.

The coloration of the body structures is variable, but differs from the preceding species, as follows: Mesonotum, vertex, frons, etc., from fuscous to ferruginous, mesonotal keels more strikingly castaneous; margins of pronotum, etc., more flavid; legs paler and more or less striped fuscous. Lateral margins near fronto-clypeal suture more or less widely fulvous.

Female. Length, 6 to 6.5 mm.

Excepting for the difference in length, the corresponding difference in the dimensions of the vertex and the darker pattern of the tegmina, there is no appreciable difference between the female and the male.

Hab. West Maui. Described from eight males and eight females, as follows: Three males and three females, Iao Valley, July, 1920, from *Euphorbia* sp. (Swezey); two males and one female, Wailuku, September, 1919 (Williams); three males and four females, Waihee Valley, February, 1920 (Giffard).

The male and female types are specimens labelled from Iao Valley, July 8, 1920, on *Euphorbia* sp. (Swezey).

Obs. Due probably to greater isolation, the Waihee Valley examples show a tendency to more maculation of the tegmina and to darker coloration than do those from Iao and Wailuku. The species is undoubtedly a close relative of the preceding.

42. **Oliarus acaciae** Kirk. Plate I, Fig. 9; Plate II, Fig. 14.

Male. Length, 4.75 to 5 mm.

Extremely like the two preceding species in structure and in the color and pattern of the tegmina. Except for the fuliginous area at basal third, the maculation is nearer that of *euphorbiae* than that of *opuna*, but in some examples a modified and sometimes hardly apparent transverse median band replacing or joining the maculae, is evident, as in the latter named species. The undulate apical band between the stigma and the apex of the clavus always seen in *opuna* is quite absent, the same as it is in *euphorbiae*. Color of the body structures much the same and as variable as in the preceding. In some examples the mesonotal and other carinae appear to be more flavid.

The aedeagus of examples dissected is nearer that of *euphorbiae*. The small spur at extreme apex of the phallus may not be constant, as in one example it was either quite absent or else lost in the surrounding membrane.

Female. Length, 5.75 to 6 mm.

The female is similar to the male, except that the coloration appears in general much paler. This coloration, like that of the pattern of the tegmina, is, however, very variable and appears to depend upon locality, e. g.: the Kaala Mountain (Waianae range) examples have more and

darker maculae, while those from Niu (Koolau range) have these more sparse and lighter.

Hab. Oahu. Redescribed from five males and five females, as follows:

Waianae Range. Three males and two females, Kaala Mountains, from *Acacia koa*, August, 1912 (Swezey), and one female, Kaala Mountains, July, 1917 (Timberlake).

North Koolau Range (windward side). One male, Waiahole, December, 1919 (Swezey); (East, lee side) one male and one female, Niu, February, 1918 (Swezey), and one female, Niu ridge, February, 1918 (Timberlake).

Obs. There is a single male specimen in the British Museum labelled "Kaala Mts. from *Koa*," representing this species as the type. No specimens of either sex were in the Kirkaldy material in the Bishop Museum at Honolulu. Evidently, Kirkaldy had not seen the female, as that sex is not referred to by him in his tables.

43. **Oliarus koae** sp. nov. Plate VI, Fig 103.

Male. Length, 5.5 mm.

Closely allied and very similar in structure and coloration to the preceding three species. It differs in structure in the width at apex of the vertex, which is one and two-tenths times the width at origin of transverse carina, in the wider and comparatively shorter fossette of vertex, and in the shortened and narrower genae between the margins of the eyes and the lateral carinae of the frons and of the vertex.

Tegmina sparingly and sparsely maculate; basal third in part fuliginous, with more or less irregular and interrupted light fuscous maculae medianly, and with scattered spots on the apical third; costal cells with three spots attached to but not fused into the costal margin as in *opuna*. Tegminal veins on basal two-thirds pale, but superficially they appear darker because of the closer and unusually distinct and prominent dark fuscous granules; costa pale, with the inner margins darker; veins on the apical third dark fuscous; cross veins nebulose, suffused; stigma dark fuscous. Wings hyaline, veins dark.

All the characters of the aedeagus are somewhat different from its allies (see figure).

I have not seen the female.

Hab. Kauai, on the high mountains back of Waimea. De-

scribed from a single male (the type) labelled Halemanu, August 26, 1921, from *Acacia koa* (Swezey).

Obs. As in other Kauai forms which are closely related to species from the other islands in the archipelago, the difference in structure and coloration in these are much more apparent. This Kauai form is no doubt one extreme and *opuna* of Hawaii the other in this particular group, the intermediates being *euphorbiae* of Maui and *acaciae* of Oahu.

44. **Oliarus niger** sp. nov. Plate VI, Figs. 88, 89, 96.

Male. Length, 6.5 to 7 mm.

Vertex variable, width at base one and four-tenths to one and five-tenths times the width at apex; width at apex equal to or a little wider than at origin of transverse carina; length about twice the width at base; carinae of apex more or less obscure because of surrounding tumescence, but appearing to curve from lateral margins of fossette to basal margins of fork of medio-frontal carina; transverse carina, about one-fourth from apex, sub-truncate; fossette variable, sub-quadrate, generally a little wider than long, anteriorly excavate with a slight tumescence at angles, giving the apical carinae of apex a more or less rotundate appearance, posteriorly tumid, but, at most, with only a rudimentary development of a median longitudinal carina.

Frons and clypeus excavate; basal angles of frons somewhat tumescent; base of fork of medio-frontal carina more or less developed, sometimes impressed, obscure, or else quite absent.

Tegmina milky hyaline, immaculate, about two and one-half times longer than wide at the middle, more or less arched at base, with the costa thickened (not as notably as in the species of the *hevahevu* group), claval area more or less nebulose, and apex of the costal cell slightly suffused fuscous. Tegminal veins, including costa, mostly piceus, but occasionally with those of the basal two-thirds fusco-piceus; granules indistinct; stigma fusco-piceus; cross veins not suffused. Wings hyaline, veins all dark.

Aedeagus with the basal spur of the phallus unusually elongate, the right median and apical spurs short; right margin of the apical third of the periandrium produced and acute. The anal and genital styles of this species are much broader than those seen in most of the other species.

Piceus with the margins of the pronotum, tegulae, vertex, and frons more or less flavous and with the flavid macula at lateral margins near fronto-clypeal suture prominent; legs fusco-piceus.

Female. Length, 7.5 to 7.75 mm.

Except as to size, the female is very similar to the male in structure. The posterior margin of the fossette, however, appears to have a more

tumid development. With exception of the tegmina, the coloration of the female is also the same as that of the male.

Tegmina milky hyaline, more or less maculate, and with the costa less arched than in the male. Claval area more or less fuliginous; an irregular, wide, and sometimes interrupted median transverse band, sparse spots on the sub-apical area, and two or more on the apical third, fuscous; tegminal veins fusco-piceus, more or less sparsely particolored whitish or yellowish on the Cl 1 + 2, the Cu (sub-apically) and the Sc. In some examples one or more, if not all, of these maculae and particolorations of the veins may be hardly apparent or quite absent.

Hab. Hawaii, in the forest along the South Kona Road, at an elevation of from 1500 to 2000 feet. Described from five males and four females, August, 1917-1922 (Giffard), and two males and one female, August, 1919 (Swezey).

Types, male and female, labelled South Kona Road, No. 9, 1900 feet elevation, August 22, 1917 (Giffard).

Obs. The vertex of the male and the pattern of the tegmina of the female of this species are quite variable. There are two female examples in the material taken at the same time and locality with males, one of which is obscurely maculate and the other quite immaculate, except for two spots on the apical third—one between Cu 1a and Cu 1b, and one between Sc1 and Sc2. How far such variations would extend in a larger series is impossible to say. The species, however, is quite unlike any other so far studied, and may be easily distinguished by the broader and more or less arched tegmina, the thickened (not notably) costa, together with the piceus appearance of the insect as a whole.

45. **Oliarus silvestris** Kirk. Plate VI, Figs. 97, 98, 101.

Male. Length, 7 mm.

Width of vertex at base one and four-tenths times the width at apex; width at apex a trifle more than the width at origin of transverse carina; length one and six-tenths times the width at base; carinae of apex obliquely curved and coalescent with basal sides of fork of medio-frontal carina; transverse carina, less than one-fourth from apex, truncate; fossette quadrate, about as wide as long, moderately excavate, posterior margin without any development of the median longitudinal carina; upper part of the genae between the anterior margins of the eyes and fossette, in profile, lengthened; lateral margins of frons (also in profile) subarcuate, and those of two-thirds of the vertex straight.

Frons and clypeus moderately excavate; fork of medio-frontal carina narrow, the base almost obsolete; median ocellus indistinct. Fore tibiae short.

Tegmina clear to cloudy hyaline, immaculate; tegminal veins on basal two-thirds pale fuscous in the clavus and Sc and R, and darker in the rest of the corium; veins on the apical third all fusco-piceus; stigma and costa fusco-piceus; cross veins not suffused; granules all dark. Wings clear hyaline.

Piceus; carinae of pronotum and tegulae narrowly, margins of lateral carinae of vertex more widely, and an elongate macula at lateral margins near fronto-clypeal suture, stramineous; legs fusco-testaceous.

Female. Length, 7.75 to 8 mm.

Excepting that the posterior margin of the fossette of vertex indicates a rudimentary development of the median longitudinal carina, and that the tegminal veins on the basal two-thirds are all pale fuscous instead of pale and dark, the female is the same as the male in structure and coloration.

Hab. Kauai. Redescribed from one male and three females, as follows: One male and one female, Summit Camp, April 23, 1922, and one female, Lihue, 800 feet elevation, May 13, 1923 (Swezey); one female labelled 640 (Kauai, July, 1896, Perkins).

Obs. In the Kirkaldy material there were two females, one of which (a damaged specimen) represents the species in the British Museum and the other, also damaged, is in the Bishop Museum, Honolulu. Both of them are labelled No. 640.

This species is easily distinguishable from most others by the lengthened upper part of the genae.

46. **Oliarus halemanu** sp. nov. Plate VI, Figs. 99, 100.

Male. Length, 5.25 mm.

Width of vertex at base one and two-tenths times the width at apex; width at apex a trifle more than the width at origin of transverse carina; length one and seven-tenths times the width at base; carinae of apex obliquely converging to the basal sides of the fork of medio-frontal carina; transverse carina, about one-fourth from apex, curved; fossette quadrate-rotundate, much wider than long (7 to 4), anteriorly deeply excavate with the angles more or less tumescent, median longitudinal carina slightly developed; median carina of vertex distinct.

Frons moderately excavate, base of fork of medio-frontal carina wide, impressed, more or less obscure; basal angles of frons more or less tumescent; fore tibiae short.

Tegmina clear yellowish-hyaline, immaculate, about one and a half times longer than broad at the middle; tegminal veins (including costa) pale

testaceous, moderately particolored fuscous, medianly; stigma pallid; cross veins (in part) more or less light fuscous; granules dark and very distinct. Wings clear hyaline, veins fuscous.

Sordid testaceous; mesonotal keels flavid; abdomen fuscous; macula at lateral margins near fronto-clypeal suture present, but very indistinct.

Hab. Kauai, on the mountains back of Waimea. Described from one male (the type) labelled Halemanu, August 29, 1921 (Swezey).

47. **Oliarus agnatus** sp. nov. Plate VI, Figs. 107, 108; Plate VIII, Fig. 139.

Male. Length, 6 mm.

Width of vertex at base one and two-tenths to one and three-tenths times the width at apex; width at apex one and one-tenth times the width at origin of transverse carina; length one and seven-tenths times the width at base; carinae of apex obliquely converging to the base of fork of medio-frontal carina; transverse carina, a little more than one-fourth from apex, curved; fossette quadrate, slightly longer (medianly) than wide, with the median longitudinal carina more or less developed, but not complete; in profile the upper part of the genae between the anterior margins of the eyes and of the fossette shortened, and the lateral carinae of vertex and of the frons almost arcuate.

Frons and clypeus very moderately excavate; fork of medio-frontal carina narrow with the base curved. Fore tibiae shortened.

Tegmina light yellowish hyaline, cloudy, immaculate. Tegminal veins (including costa and commissure) on basal two-thirds light stramineous, becoming fusco-testaceous at apical third; stigma and apical margin fuscous; granules pale, but fairly distinct.

Dark fuscous; margins of vertex, frons, etc., ochraceous; mesonotal keels more or less dark castaneous; pronotum and tegulae sordidly stramineous; macula at lateral margins near fronto-clypeal suture not at all apparent; legs fusco-testaceous.

Aedeagus with the median spur of the phallus stout and long, and the right and left apical spurs quite small, but distinct.

Hab. Lanai. Described from one male (the type), 3000 feet elevation, December 26, 1916, labelled H. G. (Gibson), No. 43, also from same region and elevation, one male, January 19, 1917, labelled H. G., No. 56.

Obs. Superficially like the typical form of *similis*, and might at first sight be mistaken for that species because of the clouded yellowish and immaculate tegmina and the similarity of color of

the veins. It is, however, quite distinct. The structure of the vertex, the very much shortened upper portion of the genae (in profile) and its smaller size will easily separate it from the *inaequalis-similis* group.

I have seen no female which I could positively associate with this species. It is to be presumed that the usual variations in color and in the proportions of the vertex will be observed, should a larger series be taken.

48. **Oliarus albatus** sp. nov. Plate VI, Figs. 104, 105.

Male. Length, 5.5 to 5.75 mm.

Width of vertex at base one and two-tenths to one and three-tenths times the width at apex; width at apex about the same as width at origin of transverse carina; length twice the width at base; carinae of apex apparently obliquely converging to basal margins of fork of medio-frontal carina, but more or less obscure, due to their coalescence with the tumescent anterior angles of fossette; transverse carina, about one-fourth from apex, curved; fossette quadrate-rotundate, almost as long as wide (4 to 5), anteriorly excavate, with the angles tumescent and median longitudinal carina rudimentary.

Frons and clypeus excavate; base of frons narrow and more or less tumescent; base of fork of medio-frontal carina obscure. Fore tibiae short.

Tegmina very milky-white hyaline, immaculate, about twice as long as wide at the middle; tegminal veins on the basal two-thirds whitish and on the apical third light fuscous; stigma fuscous; cross veins very lightly suffused, and the granules very indistinct. Wings milky-white, with the veins on the basal two-thirds whitish and on the apical third very light fuscous.

Fuscous; mesonotal carinae castaneous; pronotum and tegulae stramineous; legs, carinae of frons and vertex more or less fulvous, the macula at lateral margins near fronto-clypeal suture elongate.

Hab. Oahu. Described from one male (the Holotype), Hillebrand Glen, Nuuanu Valley, October 17, 1912, and one male, Hauula, Koolau district, August 2, 1914 (Swezey).

Obs. This small but unique species is easily separable from all other known Hawaiian species, due to the immaculate milky-white tegmina and wings and the whitish venation. The Hauulu example appears to have the transverse carina of the vertex somewhat sub-angulate, and the median carina of the fossette a little more developed than the type. A larger series may later present other variations in this as in other species. The phallus

of the aedeagus appears to have affinities to another species belonging to the Division with the median longitudinal carina of fossette completely developed, while the apical third of the periandrium is very similar in structure to species in the *taraimorai* group. I have no female in the material before me which can be positively associated with this species.

49. **Oliarus inaequalis** sp. nov. Plate VI, Figs. 110, 111.

Male. Length, 6.25 to 7 mm.

Light yellowish, clouded tegmina.

Vertex more or less wide; apical carinae very variable, either truncate, curved, or else very slightly converging; transverse carina sub-truncate; fossette quadrate, variable in length and width, but mostly wider than long, more or less excavate, sometimes with the anterior margin appearing more or less rotundate—at most with a very rudimentary development of the median longitudinal carina. In profile the upper part of the genae between the anterior margins of the eyes and the fossette, more or less lengthened, but not abnormally so.

Frons moderately excavate, basal angles slightly tumescent (sometimes little apparent); base of fork of medio-frontal carina more or less impressed, sometimes obscure or obsolete.

Tegmina from cloudy to almost clear yellowish hyaline (tawny in the dark-colored var. c, immaculate. Tegminal veins on the basal two-thirds very pale, but becoming darker toward the apical third, where they reach either a light or dark fuscous. Costa variable from flavo-testaceous to fuscous or castaneous, always more or less darker at basal and apical margins; commissure and stigma dark, but variable; granules distinct on or near apical third, indistinct on basal two-thirds, rarely colored, excepting on the darker colored varieties; cross veins not suffused. Wings either more or less milky or pale yellowish hyaline.

Mesonotum piceus, rarely light or dark fuscous; vertex, frons, clypeus and abdomen darkly, and pronotum and tegulae sordidly fusco-piceous, with all margins and carinae more or less flavous or else flavo-testaceous; macula near lateral margins of fronto-clypeal suture narrowly elongate; legs variable, from stramineous to fuscous.

Aedeagus of much the same character as in the two following species, excepting for a slight difference in the structure of the apical third of the periandrium; the apex of the phallus in this and the following closely related forms is without spurs or spines.

Female. Length, 7.75 mm.

The females which I have attempted to associate with the male have similar characters to, but are even more variable than in the latter sex.

Tegmina immaculate in some examples and maculate (sometimes hardly apparent) in others, more or less yellowish milky hyaline, but varying

according to locality, always more clearly transparent than those of the male, excepting in the darker variety (c) from the Kohala Mountains, which latter has the tegmina more or less diffused yellowish fuliginous. Tegminal veins on the basal two-thirds pale, commonly more or less sparsely particolored fuscous, the dark particolorations in some examples being also more or less suffused. This particoloration of the veins is, however, very variable, as there are examples without any such color interruptions, as well as intermediates between the extreme forms of these; on the apical third the veins are always darker and the cross veins sometimes more or less suffused. The coloration of the mesonotum, frons, legs, etc., is about the same and just as variable as in the male.

Hab. Hawaii. Described from a large series of both sexes, on miscellaneous vegetation principally in the forests along the Government road in North and South Kona, from 1917 to 1922, collected by Swezey, Giffard, and Timberlake; also two males labelled 691 (Kilauea, 1895), and one male labelled 635 (Olaa, 1896, Perkins) in the Kirkaldy material; two males, Kilauea, Kau, 1917 to 1918, and two males Olaa, Puna, 1912 to 1918 (Giffard); one male and one female, Kohala Mountains, 1917 (Swezey). There are also a number of females from the Kona region by the same collectors which have the middle and (sometimes) the apical third of the tegmina banded or spotted fuscous which appear to be extreme forms of this species. These are placed here provisionally.

Light yellowish clouded tegmina (not maculate). The male type is a specimen labelled South Kona Road, 1600 feet elevation, August 26, 1917 (Giffard), and the female labelled Kau Road, January 16, 1917 (Muir and Giffard).

Var. a.

Male. Length, 7.5 mm.

The male of this variety has the tegmina more clearly hyaline, but still retaining the yellowish appearance of the preceding. The female has the tegmina clear hyaline, with the veins largely pale on the basal two-thirds with sparse particolorations medianly; apical third dark, cross veins not suffused.

Hawaii. One male and one female (var. types), Puuwaawaa, North Kona, 3800 feet elevation, August 24, 1917 (Giffard).

Var. b.

Male. Length, 8 mm.

A larger and less typical variety with medium colored tegmina from the

high mountain region above the Kona district, Hawaii. Tegmina shining, clear yellowish hyaline, veins darker medianly and apically. Other characters, including the genitalia, typical.

Hawaii. A single male (var. type) in the woods above Dowsett ranch, Kona, at 7000 feet elevation, 1921 (Wilder).

The female of this variety may possibly be included among those associated with some of the other varieties.

Var. c.

Male. Length, 7 mm. (*Dark-colored tegmina.*)

Structurally much the same and as variable as in the preceding, but with the tegmina more or less dark or tawny yellowish, and the tegminal veins on the basal two-thirds pale or dark stramineous and on the apical third dark fuscous. Costa darker and thicker. Wings hyaline, with the apical outer margins largely fumose, veins fuscous. The female has the tegmina lighter yellow and more clearly hyaline. The type variety has hardly apparent suffused fuscous spots on the costal area and at extreme apex of the tegmina, but there are extreme varieties which are quite maculate, the middle third banded or spotted fuscous. The female also has the tegminal veins very variable with some of these suffused fuscous medianly, and with others very lightly (if at all) particolored.

Hab. Hawaii. Eight males and thirteen females from the Kohala Mountains along upper Hamakua Ditch Trail, 1917-1919 (Swezey). One male, labelled Kohala Mountains, May 24, 1917, I have not included in the series because of certain differences in structure of the genae.

The male and female types of this variety are labelled Kohala Mountains, upper Hamakua Ditch Trail, September 3, 1917 (Swezey).

Obs. This is one of the most variable species found on the island of Hawaii. The lighter colored forms are common in the Kona district on varied vegetation along the Government road, but apparently are scarcer in individuals in the Kau, Puna, and Hilo localities collected. The darker and more striking variety (c) from the Kohala Mountains is no doubt not uncommon in that region. Here and there in isolated regions on the island, unique examples of the species are found with the mesonotum, either dark or light fuscous, and having the tegmina more clearly hyaline, but still retaining the more or less yellowish

appearance, which is characteristic of this and some others of the group.

There is apparently but little difference in the structure or characters of the aedeagus of this species and of its varieties, and these indicate very close affinities to *similis* of Maui, as well as *inconstans* of Hawaii. Both of these latter species are undoubtedly extreme forms of *inaequalis*.

The type female of the species, which I have selected, has immaculate tegmina and is without the particolored venation seen in most of the specimens of that sex. It is by no means quite representative of all those studied. In the material before me there appeared to be so many intermediate forms in both sexes as to make it difficult to select from these with any great degree of certainty any one example which might be clearly typical. Among some of the questionable females are specimens which have the tegmina more or less maculate, the middle third having a fuscous band, the apical third more or less sparsely spotted, and the median tegminal veins suffused, appearing more or less particolored I do not doubt, however, but that these are merely extreme variations within the species.

Some of the forms or varieties of this species, particularly those with the light colored tegmina, have been mistaken for Kirkaldy's *koanoa*, but this latter species is quite distinct and belongs to the division with the fossette completely carinate medianly and with small and ovate areolets. Superficially, however, there is a strong resemblance between *koana* and the light forms of *inaequalis* of Hawaii and of *similis* of Lanai, Maui, and Molokai. Besides the difference above noted, the character of the aedeagus of *koanoa* is quite different from the others above mentioned.

50. **Oliarus similis** sp. nov. Plate VIII, Figs. 127, 128.

A very variable species superficially and structurally like the preceding (*inaequalis*), to which it is very closely related.

The color of the tegmina varies from an almost clear to a tawny yellowish hyaline. The tegminal veins on the basal two-thirds, including the costa, are also very variable in coloration, partaking more or less of the color of the membrane in some and in others distinctly darkened.

The dissection of the aedeagus in eleven examples (including varieties) revealed in all of these a slight difference in the structure of the apical

third of the periandrium, and in three only did the apex of the phallus indicate rudimentary spines. In two of these latter instances there were present minute right and left spines, and in the other a minute left spine only. Normally, the apex of the phallus of this species has neither spines nor spurs. In all the examples dissected the ventral margin of the periandrium, viewed laterally, is armed near the middle with a distinctly longer and stouter tooth than in its allies. The structural outline beneath the tooth is also different.

In this species the color of the tegmina of the females follows, in most part, that of the males, but there are here and there exceptions which are more or less confusing. The tegminal veins in the females are also very variable, some having these particolored and others not. The tegmina of the extreme varieties may also be either immaculate or maculate.

Male. Length, 6.25 to 6.5 mm.

Mesonotum and frons fuscous; legs testaceous, but variable. Tegmina almost clear hyaline, immaculate; veins on the basal two-thirds pallid, and on apical third light fuscous; costa mostly pale, granules distinct, more or less colored; stigma from very light to a darker fuscous.

The females associated with this typical form are so variable as to the particoloration of the tegminal veins, that it is quite possible one or more may belong to the varieties which follow.

Hab. Lanai. Eleven males and five females, 2000 feet elevation November to February, 1916-1917 (Munro-Gibson—H. G.). The male and female types are labelled Munro—H. G., No. 18, December 5, 1916.

Var. a.

Males. Length, 7 mm. Females. Length, 7.5 mm.

The same as the preceding, except that the mesonotum is more or less piceous and in some the mesonotal carinae are faintly castaneous. Tegmina clouded yellowish hyaline, immaculate; veins very pale on the basal two-thirds and dark fuscous on the apical third; granules more or less indistinct and pale.

The females which I have associated with this variety are very variable in the coloration and pattern of the tegmina and veins. In some the tegmina may be either quite immaculate or else may be spotted or banded fuscous on the middle third, and spotted, more or less, on the apical third. The tegminal veins may or may not be particolored on the basal two-thirds.

Hab. Maui, Lanai, and Molokai. Three males and two females, Wailuku, Maui, 2000 feet elevation, December 9, 1922 (Swezey); one male, Kailua, Maui, June, 1920 (Bryan); six males and seventeen females Lanai, 1916-1917 (Munro-Gibson);

one male (from Bishop Museum—Kirkaldy material) labelled Molokai Mountains, 4000 feet elevation, 1893 (Perkins).

The male and female types of this variety are immaculate examples from Wailuku, Maui, December 9, 1922 (Swezey).

Var. b.

Males. Length, 6.75 to 7 mm. Females. Length, 8 mm.

Mesonotum, frons, etc., piceus; margins of pronotum, tegulae and vertex and the carinae of the frons, more or less fulvous; legs flavo-testaceous.

Tegmina clouded yellowish hyaline, but of a somewhat darker shade than the preceding, immaculate; veins on the basal two-thirds pallid, and on the apical third fuscous; costa more or less fuscous; granules distinct, more or less colored. The females associated with this variety have the tegmina clear hyaline, but more or less suffused yellowish fuliginous, with the veins on the basal two-thirds more or less particolored fuscous and whitish or yellowish, and on the apical third dark fuscous. They appear darker and quite unlike the males.

Hab. Maui and Molokai. One male and three females, Olinda, Maui, 4200 feet elevation, May, 1918 (Fullaway and Giffard); four females, Haleakala, 5000 feet, July, 1919 (Timberlake); one male, Molokai Mountains, 4500 feet elevation, 1893 (Perkins).

The type, male and female, of this variety are Olinda, Maui, specimens labelled May 13, 1918 (Giffard and Fullaway).

Var. c.

Males. Length, 7 to 7.5 mm. Females. Length, 7.5 to 8 mm.

The same as preceding variety, but with the margins of the pronotum, tegulae, frons, etc., less fulvous, and the tegmina more clearly but more darkly yellowish hyaline on the basal two-thirds and becoming still darker on the apical third, with the extreme apex suffused fuliginous; the tegminal veins on the basal two-thirds partake of much the same color as the membrane, becoming dark fuscous on the apical third; costa and stigma from light to dark fuscous; granules more or less indistinct and pallid. Wings smoky hyaline, narrowly nebulose apically. The female is like the male, inclusive of the tegminal veins, which are immaculate.

Hab. Maui. Eleven males and seven females from various localities on the windward side of Haleakala, June, 1920 (Bryan).

The type, male and female, are specimens from Halehaku, Maui, June 24, 1920 (Bryan).

Obs. I have hesitatingly separated this species and its varieties from *inaequalis* of Hawaii because of the similarity in structure and color. With so many varieties and intermediates in both species, to have done otherwise than separate it might later have led to confusion in determinations through the further splitting into species of some extreme varieties, of which it is very doubtful that a reasonable series could be collected. The separation of these two island forms will at least assist not only in the differentiation of determinations, but will also lessen the possibilities of adding or duplicating innumerable and quite unnecessary varieties and intermediates to one or both of the species. The island and locality where collected, together with the difference in certain characters of the aedeagus which can be easily discerned by workers who will trouble themselves to study these, will, I am sure, materially assist in determining one from the other of two of the commonest, most variable and homogeneous species of Hawaiian Cixiids.

It may here be noted that males and females with or without maculate tegmina, have been taken together *in situ*. The labelled examples not only indicate this, but in the case of those from Lanai the writer can personally confirm the above fact from notes sent him at the time by the collector he had engaged to secure specimens on that island.

The above remarks are equally applicable to the other species or forms in this particularly variable group.

51. **Oliarus instabilis** sp. nov. Plate VIII, Figs. 129, 130, 131, 137.

Male. Length, 6 mm.

Width of vertex at base one and three-tenths to one and four-tenths times the width at apex; width at apex equal to width at origin of transverse carina; length one and seven-tenths to two times the width at base; carinae of apex more or less thickened, curved when at all apparent, but generally obscured by surrounding tumescence; transverse carina, about one-fourth from apex, sub-truncate; fossette sub-quadrate rotundate, a little wider than long (five to four), excavate, the posterior margin more or less tumid, but with no development of median longitudinal carina. (In some examples it may be very rudimentary.)

Frons and clypeus excavate; basal angles of frons more or less tumescent, base of fork of medio-frontal carina distinctly fused with apical carina of vertex, seldom impressed or obscure. Upper part of the genae

between the anterior margins of the eyes and fossette (seen in profile) more or less (not abnormally) lengthened. Fore tibiae shortened.

Tegmina clouded, but more or less milky hyaline, immaculate, about two and three-quarters longer than wide at the middle (five to one and three-quarters). Tegminal veins on basal two-thirds all pale, more or less flavo-testaceous, the costa and apical third fuscous; granules dark, distinct; stigma fuscous. Wings clear hyaline, veins fuscous.

The structure of the apical third of the periandrium of aedeagus very variable in outline, depending greatly on the viewpoint when examined; apex of phallus generally without spurs or spines.

Fusco-piceus; mesonotal carinae more or less castaneous; margins of pronotum, tegulae, vertex and frons stramineous, the flavid macula near lateral margin of fronto-clypeal suture narrowly elongate; legs testaceous.

Female Length, 7 mm.

Structurally, the female is very similar to the male, but is quite different in color and in the pattern of the tegmina.

Tegmina clear to milky hyaline, sometimes with a median obliquely transverse fuscous band (often interrupted) on the basal two-thirds from the clavus to the radius, or else with spots only on the Cl f and Cu f, or with one or all of these hardly apparent or quite absent; the apical third may or may not be spotted, but when at all, the spots are faint and sparsely distributed. Tegminal veins on the basal two-thirds more or less fulvous with fuscous particoloration (sometimes suffused) sparsely distributed medianly, but evidently always present on the Cl f and Cu f and the Sc; veins on the apical third fuscous; stigma light fuscous; cross veins more or less suffused, but variable.

Mesonotal carinae more strikingly castaneous than in the male; margins of pronotum, tegulae, vertex, and frons fulvous; legs more or less flavid.

Hab. Oahu, on the eastern mountain range. Described from two males and four females, Wailupe, May 30, 1919 (Swezey); four males, Niu ridge, February, 1918 (Timberlake); one female, Waialae Nui, April, 1916 (Swezey), and one female, Wailupe, April 21, 1918 (Timberlake).

The male and female types are labelled Wailupe, Oahu, May 30, 1919 (Swezey).

Var. a.

Male. Length, 6 mm.

The same as the preceding. I have separated it as a variety particularly because of the extreme structural form of the apical third of the periandrium of the aedeagus.

Oahu. One male, Kaala Mountain (Waianae mountain range), August, 1912 (Swezey).

Var. b.

Male. Length, 6 mm.

Typical, except that the tegmina are a little wider at the middle and that the mesonotal carinae are fuscous.

Oahu. One male, Olympus, June 18, 1916 (Timberlake).

Var. c.

Male. Length, 6.5 mm. Female. Length, 7.5 mm.

Also typical, except for its length and that the mesonotal carinae, like those in Var. b, are not castaneous.

Oahu, on both mountain ranges. One male and four females, Mount Kaala, May 18, 1920 (Swezey); one male, Palolo, June, 1917 (Bridwell); one male, Olympus, June 18, 1916; one male, Kaumuohona, July 16, 1916, and two males, Mount Kaala, July 9, 1916 (Timberlake); two males, Olympus, June to October, 1918-1921 (Swezey).

Var. d.

Male. Length, 6.5 mm.

Same as the last, but with mesonotal carinae castaneous.

Oahu. One male, Waialae Nui, April 22, 1917 (Swezey).

Var. e.

Male. Length, 7 mm. Female. Length, 7.5 mm.

Longer, with the mesonotal carinae piceus and the tegmina more cloudy hyaline; otherwise, there is no other difference in structure to warrant separating it. The tegmina, in what I take to be female examples of this variety, are not maculate, but appear to follow the extreme typical immaculate form of that sex.

Oahu. Two males and one female, May 18, 1920; one male, July 9, 1916, and one female, July 22, 1917, all from Mount Kaala (Timberlake); one male, July 4, 1916 (Mount Kaala, O. H. S.), and one female, Waiahole, August 13, 1916 (Swezey).

Var. f.

Male. Length, 7 mm. Female. Length, 8 mm.

Same as the preceding variety, excepting that the tegmina are of a yellowish hyaline and appear more shining.

Oahu. One male and two females, Punaluu, August 9, 1914

(Swezey): one male, Lanihuli, July 18, 1920 (Bryan); one male, Olympus, June 18, 1916 (Timberlake), and one male, June 11, 1916 (Timberlake).

Obs. This is a very variable species and no doubt represents the Oahu form of what I have called the "*inaequalis-similis*" group from Hawaii and Maui. As in that group, the structures and colorations are very unstable, the sexual dimorphism confusing, and the characters of the genitalia in a marked degree variable. Of the seven dissections made of the aedeagus, no two are quite alike as to the structural outline of the apical third of the periandrium, but all have a similarity in one aspect or another. In all of these the apex of the phallus was without spurs, but even this apparently constant character may vary to a slight degree, as one of the examples was found to have a very small and hardly visible spine on the right margin. The pale venation on the basal two-thirds of the tegmina is also variable, some examples having these somewhat darker than others, but, like the other various degrees of venation, all are within the species and there is no lack of intermediates to select from.

52. **Oliarus inconstans** sp. nov. Plate VIII, Figs. 132, 133.

Male. Length, 6 to 6.5 mm.

Width of vertex at base one and six-tenths times the width at apex; width at apex five-tenths to one time the width at origin of transverse carina; length one and six-tenths times the width at base; carinae of apex variable, more or less curvate or else sub-truncate; transverse carina, somewhat more than one-fourth from apex, curved; fossette quadrate, broader than long but variable, more or less excavate, posteriorly tumid, but without a median longitudinal carina.

Frons and clypeus moderately excavate; base of fork of medio-frontal carina more or less obscure. Viewed in profile the upper part of the genae between the anterior margins of the eyes and the fossette more or less lengthened, but not abnormally so.

Tegmina clear, but sometimes more or less milky hyaline, maculate but very variable; basal two-thirds with the claval area more or less clouded fuliginous, sometimes with an obliquely transverse, but faint median light fuscous band or macula, or else the tegmina may be more or less yellowish fuliginous, with the maculae little apparent or quite absent; inner margins of the apical third more or less suffused light fuscous. Tegminal veins on the basal two-thirds all pale yellowish, except for fuscous particolorations

medianly; on the apical third the veins are from light to dark fuscous; costa and stigma fuscous. Wings hyaline, veins light fuscous.

The characters of the aedeagus are the same as in the preceding.

Color variable, the maculate forms darker than the immaculate. Mesonotum, pronotum, vertex, frons, etc., generally piceus, but sometimes the mesonotum is dark castaneous; all margins and carinae of the head and thorax sordid yellow; macula at lateral margins near fronto-clypeal suture the same as in the preceding; legs fusco to flavo-testaceous.

Female. Length, 7 to 7.5 mm.

Same as the male with the structures of the vertex proportionately larger. The venations and pattern of the tegmina and particoloration of the veins are also proportionately greater and more striking than those of the males.

Hab. Hawaii, mostly in the vicinity of Kilauea. Described from four males and eight females, viz.: *Maculate* vars: Two males and one female, Kilauea, September, 1919; two females, Kilauea and Olaa, August, 1920; two females, Kilauea, August, 1917; one female, Glenwood, August, 1921 (Giffard); one female, Kau Road, January, 1917 (Muir and Giffard). *Immaculate* vars: One male, Kilauea, May, 1911 (Swezey); one male, Kilauea, September, 1919 (Giffard); one female, Kau Road, January, 1917 (Muir).

The male and female types are maculate examples labelled Kilauea, Hawaii, September 6 and 8, 1919 (Giffard).

Obs. This variable species is closely related to the preceding species, and may be more generally distributed over the island of Hawaii than the small series before me would indicate. It is more likely to be found in isolated areas on the more or less scrubby vegetation of ancient lava flows, while its closer relatives *inaequalis* and vars. are found to be common among the well-vegetated forests of Kona and the Kohala Mountains. The latter has been rarely found in the wet and dense forests around the Kilauea and Olaa regions. The maculate Kilauea examples of *inconstans*, with one exception, were taken by the author from mixed scrubby vegetation in an old crack or fissure in the arid desert hardly a stone's throw from the edge of the Halemaumau active crater. (This deep fissure was later filled up by the 1922 lava flow.) The female examples taken on the Kau Road and in Olaa, and one male from Kilauea, I have associated with the Kilauea types with some reservation.

While the type examples have the apex of vertex more or less curved, there are indications that this character (as well as the colorations in general) varies according to locality, as others apparently (particularly among the females) have the apex truncate.

The aedeagus indicates that this species is merely another form of *inaequalis* and its insular allies, and is equally as variable as these. As a general rule, among all such very closely related forms or varieties, the apical third of the periandrium, and in a measure the exact position of the spurs or spines of the phallus, varies more or less in each; but these variations are apt to be somewhat amplified, diminished, or otherwise modified according to the position in which the aedeagus is placed and viewed by the worker. This feature applies not only to the structures of the aedeagus, but also, in a way, to certain characters of the vertex in all the Hawaiian species.

The following six species in Kirkaldy's tables, five of which were not otherwise described by him, I have been unable to identify among the material studied:

Oliarus procellaris Kirk.

Oahu. Male. Length, 6 mm.

Synopsis. Mesonotum black; tegmina immaculate, short and broad; tegminal veins dark or partly pale.

Obs. No specimen bearing this name is in either of the museums. The summary of the tabular description is inadequate and, in some measure, confusing. One or more forms in the *kaonohi-filicicola* group appear synonymous.

Oliarus pluvialis Kirk.

Kauai. Male. Length, 8.5 mm.

Synopsis. Same as the preceding, with elongate tegmina.

Obs. This species is represented in the British Museum by one female labelled "Makaweli, Kauai." Neither sex is in the Kirkaldy material in the Bishop Museum.

Oliarus monticola Kirk.

Maui. Male. Length, 6 mm.

Synopsis. Vertex (transverse carina?) rounded or sub-angular apically; mesonotal keels black; tegmina maculate, scarcely more than twice as long as broad on basal half; tegminal veins particolored on basal half; costal margins pale brown.

Obs. This species is represented by one specimen (a male) in the British Museum, labelled "Haleakala, Maui, 5000 feet elevation." I have been unable to find any specimens from Maui which in any way agree with the above tabular description.

Oliarus paludicola Kirk.

Molokai. Female. Length, 10.5 mm.

Synopsis. Tegmina largely maculate with four black spots on the costal area, and the tegminal veins particolored on the basal two-thirds.

Obs. The four black spots on the costal area are, no doubt, as variable in this as in other similar maculate forms. The description indicates that it may possibly be the Molokai form of *haleakalae*. The species is represented in the British Museum by a single female from Molokai.

O. nemoricola Kirk.

Hawaii. Female. Length, 8.25 mm.

This may possibly be one of the variety forms of either the *kanakanus* or *hevaheva* groups. The black tegminal veins with the radial partly white and the apical third spotted, might well apply to varieties in either of these groups in one or more localities on Hawaii. Until closer collecting gives us more material for study, a large degree of uncertainty will remain as to the proper determination of the females of forms or species with maculate tegmina. There is no female of this species in either museum to represent the type and the single specimen selected for the British Museum was a male.

Oliarus orono Kirk.

Kauai. Female. Length, 8.5 mm.

Obs. This is one of the species described by Kirkaldy in the

Fauna Hawaiiensis. His original description and that given by him in his tables do not quite agree. Furthermore, the tables refer to the female only, while both sexes are included in the original description. I have seen no male specimens from Kauai which I can refer to this species with any degree of certainty. There are one or more females in the Kirkaldy material at the Bishop Museum which were determined as this species and which in a degree follow the characters stressed by Kirkaldy in his general description. There will, however, have to be much closer collecting done on Kauai and much more material obtained before a definite determination can be made as to what the male of the species may be like. Neither sex is represented in the British Museum, but according to my information there is a *female* example marked "*type*" by Kirkaldy himself in the University Museum, Cambridge. This latter specimen was used for the figure in the Fauna Hawaiiensis.

Var. *molokaiensis* and var. *oahuensis* (of *orono*) cannot be identified until we know positively what the male of *orono* is. The description of the species in the Fauna does not discriminate between the sexes, and no male type is known. The marked sexual color dimorphism in these forms, with maculate tegmina, is such that any descriptions based on the female tegminal color characters are not to be relied on as applicable to those of the male, which latter in many instances may have these quite immaculate. This will also be found to apply to the particolorations of the tegminal veins in a great many of our species.

IOLANIA * Kirkaldy.

Iolania appears to be an endemic genus related to *Cixius*. It is represented by five very closely related species, one each on Hawaii, Maui and Lanai, and two on Oahu. It is evidently derived from one ancestor, possibly a *Cixius*, which is now extinct.

A study of the male genitalia, through dissection, reveals the fact that the aedeagus is practically the only means of discrimi-

* The following remarks on *Iolania* were presented at meeting of Hawaiian Entomological Society, September 7, 1922, but subsequently withdrawn by the author.

nating the species in this genus. In 1902[1] and again in 1909[2] the late G. W. Kirkaldy, after a careful examination and study of a number of examples widely distributed in several regions of the islands of Hawaii, Oahu, and Lanai, could find no character to separate the insular forms, and as a result erected but one species, *perkinsi*, to represent the genus. Kirkaldy claimed not to have used the genitalia in the differentiation of the species, as the visible parts were unsatisfactory, and the others not evident without dissection.

From a fairly large series collected in several localities and at various elevations on the islands of Hawaii, Lanai, and Oahu, and a smaller one from the mountain region of Maui, the author has been able to continue Kirkaldy's studies and finds that the body characters and the venation of the tegmina present no variations of specific importance. The coloration of the tegmina, e. g., var. *notata* Kirk.[3] is very variable in all localities from the islands above named. In some the patterns or blotches on the tegmina are from pallid to a dark brown, or these may be very dark at either the base, middle or apex. All these color forms, however, unless supported by structural characters, should not be considered of importance, as, were varieties erected on such, each island would present at least two or more color varieties and eventually there would be no limit to such kind of discrimination. On the other hand, an examination of the male genital organs, including dissection of the aedeagus, presents what may appear to be the only method by which the species can be separated. As a result of the material studied, the author has been able to recognize five distinct species, viz.: One each from Hawaii, Lanai and Maui, and two from Oahu. The aedeagus of the Hawaii and Oahu species, strange to say, resemble each other much more than do those from Maui and Lanai, notwithstanding that these two latter islands form part of the central, or intervening insular, connections between Oahu and Hawaii. The species from the two last named islands are apparently very much more closely allied to each other than those from either Maui or Lanai. Examples in identical regions

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1 Fauna Hawaiiensis, III, Part 2, 1902, p. 119.
2 Proc. Haw. Ent. Soc., II, No. 2, 1909, p. 75.
3 Proc. Haw. Ent. Soc., 1909, l. c., 75.

on each island vary in size, although it would appear that those from Hawaii (*perkinsi*) are in general slightly larger and longer than others. In the latter species the fossette of vertex appears smaller, and the median longitudinal carina dividing it into areolets is shorter than that seen in other island examples, but there is no doubt that a large amount of material would reveal variations in this respect.

The pygofer and genital organs of the male, including the aedeagus, are of much the same general form in all the species, and, with the exception of the aedeagus present, no differences of specific importance. The upper half of the periandrium is very membraneous, the thin membrane being more or less produced in front from the conjunctiva downwards, forming, as it were, a hood. This very membraneous structure (the phallus), together with the conjunctiva and the position of the functional orifice, are very complex and will, no doubt, need further anatomical study before these parts can be positively placed or properly described. Furthermore, the periandrium and the phallus are so closely amalgamated that it is not possible, without such study, to decide their limits. The large processes at the sides, which I have called the "*phallus hooks*," may pertain either to the periandrium or to the phallus—most probably to the latter. This arrangement of the aedeagus differs from that of the Hawaiian species of *Oliarus*, the latter having a phallus differentiated from the periandrium. Later on, the careful dissection of the aedeagus from freshly captured specimens may fully elucidate these questions, as well as throw further light on other anatomical features. For the present, however, it will suffice to mention that the dissections of the aedeagus (from old specimens) when these are underboiled in caustic soda and later viewed under high power magnification, apparently disclose characters which may not be revealed in fully boiled examples and by the use of lower power objectives. The author, as a result of this, has noticed that in the Oahu and Hawaii examples the somewhat nebulous appearance of the membraneous phallus, as seen through the binocular, is due to very minute but conspicuous hair-like spines diffused over most of its surface. In the three species from these two islands the phallus in front appears oblong-oval, somewhat narrowed anteriorly, the center

being more or less longitudinally depressed, widest at the apex, and narrowest at the base, where the membrane forms a "funnel-like" opening which apparently is the functional orifice. In the Lanai examples this membraneous structure appears almost circular in shape, the anterior portion at the sides forming a rounded surface which narrows downwards to two-thirds of its diameter. The central depression of this species, posteriorly, occupies more than half of the membrane, the anterior edge forming a hood-like protection to the opening beneath, which latter, apparently, represents the functional orifice. The paucity of material for dissection and study from the island of Maui has prevented further anatomical investigation of the aedeagus of that species, but from examples previously dissected, and now viewed under the compound microscope, the marginal and other outlines of the phallus are fairly well seen. In this Maui species the phallus is elongate, much wider at the apex than at the base, the sides at the lower portion forming lobes which curve upwards until they meet the "hood-like" protection to the functional orifice, as in the Lanai species.

The aedeagus of the Lanai and Maui species are without the conspicuous hair-like spines which are associated with those from Oahu and Hawaii.

It is to be regretted that as yet no material of this genus has been collected from either Molokai or from the most northern island, Kauai. It would be particularly interesting to know whether or not the genus is represented on Kauai, as if it is not that fact might indicate that the ancestor of *Iolania* originated in this territory after Kauai had become separated from the rest of the archipelago. There is but little doubt that the genus occurs on Molokai, as it already does on the quite adjacent islands of Maui and Lanai, and that, in order to secure examples, it merely needs closer collecting on that island. On the other hand, although Kauai has produced a number of species of the genus *Oliarus*, and has lately been fairly well exploited for insects, no specimens of *Iolania* have as yet been taken there.

The author's general remarks under *Oliarus* as to magnification, dissections, mounts, figures of the genitalia, and the depository of types are also applicable to the small amount of material of this genus he has had at his command for examination and study.

In addition, however, he has to thank Mr. Muir for special assistance in interpreting the taxonomic studies of the genitalia. Acknowledgments are also due to the Bishop Museum and to Messrs. Perkins, Swezey and others for the loan of their collections, with permission to dissect.

Description of Male Genitalia of Species.

(1) **Iolania perkinsi** Kirk. Plate VIII, Fig. 134.
Fauna Hawaiiensis, III, Part 2, 1902, p. 119.
Proc. Haw. Ent. Soc., II, No. 2, 1909, p. 75.

Aedeagus. The base of the periandrium on the ventral side and the phallus on its whole dorsal surface diffused with minute, but conspicuous spines.* The "phallus hooks" or chitinized side processes wide throughout their length, their inner and outer margins more or less sinuate, terminating gradually to a point.

Hab. Described from the dissections of thirteen examples, selected from series collected in widely distributed regions at various elevations in East and West Hawaii, as follows: One each from Olaa, 1500 feet, November, 1896 (Perkins), No. 635; Kilauea, 4000 feet, August, 1895 (Perkins), No. 568; "Twenty-nine Miles" Olaa, 3800 feet, October, 1916, "Twenty-five Miles" Olaa, 3000 feet, September, 1917, South Kona Road, 1600 feet, August, 1917, Glenwood Olaa, 2300 feet, September, 1917, Crater Road, Kilauea, June, 1918, and Middle Puna, 750 feet, August, 1918 (Giffard); Kohala Mountains, May, 1917, Kaiwiki (above Hilo), September, 1918, and Kaumana (above Hilo), April, 1920 (Swezey); Kealakakua, Kona, 3000 feet, August, 1919 (Timberlake); "Twenty-three Miles" Olaa, 2300 feet, September, 1919 (Fullaway).

Obs. Kirkaldy's type in the British Museum is a male specimen labelled No. 691 (i. e., Kilauea, Hawaii, July, 1895, Perkins Coll.). Among the series not above enumerated there

* Best viewed through the compound microscope with high power objective.

are a few males and a number of females in the Bishop Museum material, some being part of the Kirkaldy material (in more or less bad condition) and some collected by Perkins, Swezey, Gifford, Bryan, and others. The most of these latter are female specimens. The type of var. *notata* Kirk. was not found in either museum. I am informed by Dr. Perkins that an Olaa example was used for the figure in the Fauna Hawaiiensis.

(2) **Iolania oahuensis** sp. nov. Plate VIII, Fig. 138.

Aedeagus. Very closely allied to *perkinsi*, differing mainly in that the phallus hooks are less wide throughout their length than in that species, and that the sinuated inner margins terminate *abruptly* to a point. The minute spines on the phallus and at the base of the periandrium on the ventral side are also much more conspicuous and more numerous than in the preceding.

Hab. Described from the dissections of thirteen examples selected from a series collected in widely distributed regions on both mountain ranges on the island of Oahu, as follows: Two from Palolo, 1800 feet, August, 1906; one each from Manoa Cliffs, October, 1919, Tantalus, 1300 feet, October 1905 (Giffard); one each from Kaumuohona, 2500 feet, March, 1912, Kuliouou, June, 1916, Kaala Mountains, July, 1916 (Swezey); two from Olympus, 2500 feet, January, 1912 (Fullaway): two from Cook Trail, March, 1916 and 1917 (Timberlake); one each from Wahiawa (Swezey), and Waiahole, August, 1916 (Timberlake). I have selected a Palolo example as the type.

Obs. Because the aedeagus is superficially close to that of *perkinsi*, I have hesitated erecting this species. The fact, however, that the differences above described are constant in these Oahu forms leads me to believe that the two should be separated.

(3) **Iolania koolauensis** sp. nov. Plate VIII, Figs. 141, 142.

Aedeagus. In this species the apodeme of phallus is largely produced beyond the conjunctiva, which readily distinguishes it from its allies, *perkinsi* and *oahuensis*. The "phallus hooks" terminate gradually to a point as in *perkinsi*, and in this respect do not follow those of *oahuensis*. The form of the genital styles, apically, is much less rounded and stouter than in the two species above named.

Hab. Described from the dissections of six examples collected by O. H. Swezey, in the northwest Koolau region of

the island of Oahu, as follows: Waiahole, August 13, 1916, one specimen; Punaluu, June, 1911, and August, 1914, three specimens; Opaeula, April, 1921, two specimens. The type specimen is from Waiahole.

Obs. This species appears to be local to the windward side of the northwest Koolau Mountain range. I have not come across it among examples studied from the leeside, but it is most probably there, as well as on the Waianae range. On the other hand, the example of *oahuensis*, labelled Waiahole, August 13, 1916, by Timberlake, was captured on the same day and in the same locality as Swezey's example of *koolauensis*.

(4) **Iolania mauiensis** sp. nov. Plate VIII, Fig. 135.

Aedeagus. In this species the "phallus hooks" have their inner margins concave and the outer margins convex, narrow at base, and much wider near apex, where they terminate very abruptly in an acute point. The minute spines at the base of the periandrium and on the phallus are conspicuous by their absence in this species. The genital styles in this and the following are much more rounded apically and less stout than in the three preceding species.

Hab. Described from the dissections of two examples collected at Waialuaiki and Waialuanui, Maui, February to March, 1920, by E. H. Bryan and from the dissection of one example collected by P. H. Timberlake in Keanae Valley, Maui, July, 1919. These regions are situated on the windward side of Mount Haleakala. I have not had specimens from lower elevations on this island to examine. I have selected the Waialuaiki specimen as the type.

Obs. The aedeagus of this species is much smaller than either of the preceding, and the structure of the "phallus hooks" is altogether different, resembling no other thus far examined.

(5) **Iolania lanaiensis** sp. nov. Plate VIII, Fig. 136.

Aedeagus. Inner margins of "phallus hooks" concave, sinuate, widest at their basal two-thirds, and gradually narrowing to a point. Outer margin convex or nearly so. Like *mauiensis*, this species is devoid of minute spines at base of periandrium and on the surface of the phallus.

Hab. Described from the dissections of seven examples selected from a large series in the author's collection which

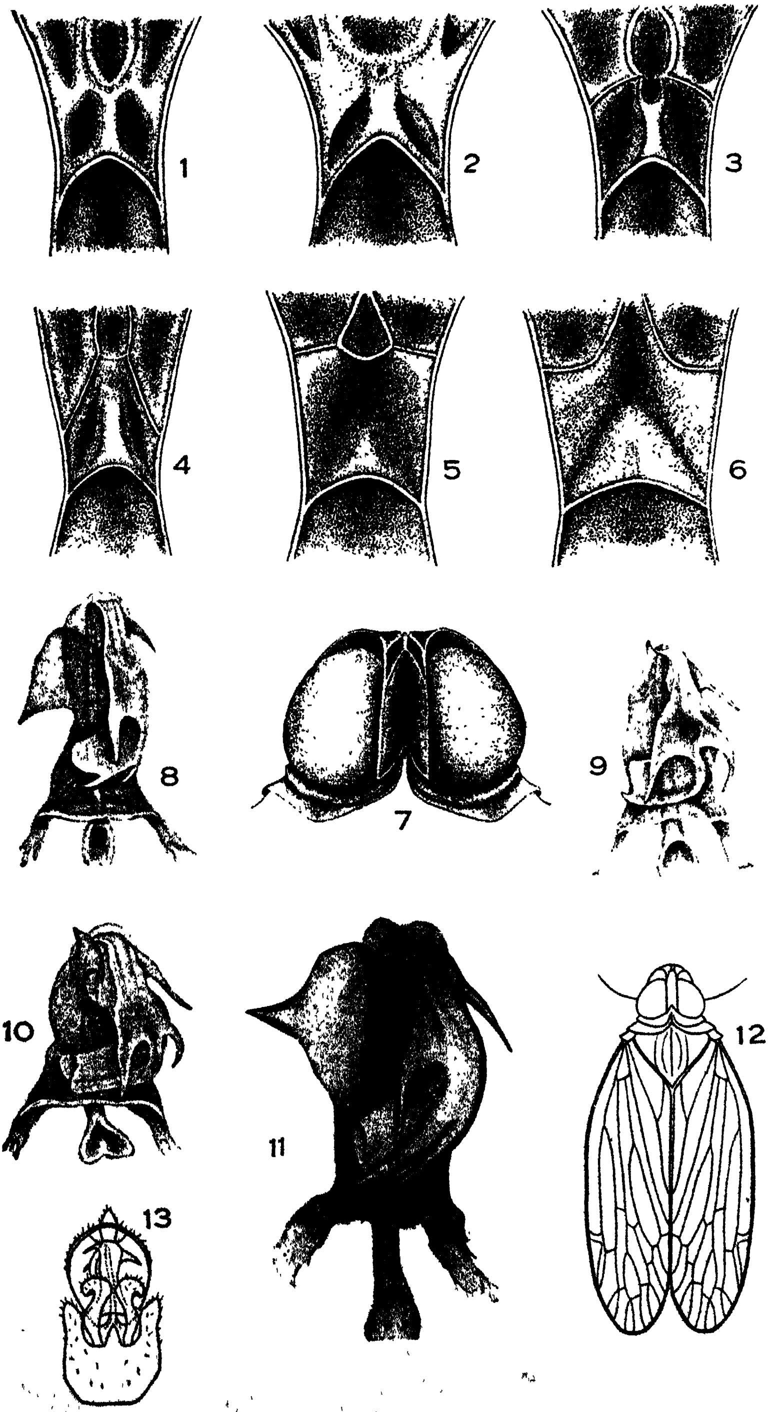
were collected in several localities in the mountain district of the island of Lanai. The type specimen selected is labelled 3000 feet elevation, December 18, 1916.

Obs. The aedeagus of this species is quite small, and the "phallus hooks" quite different in structure from any of the preceding. In the large series examined there are the usual two or more color variations of the tegmina with their intermediates. One or more fragments of specimens labelled from Lanai and collected by Dr. Perkins, which were in the Bishop Museum collections, are not recognizable, having been badly damaged at some time in the past.

PLATE I.

[Note: Unless otherwise designated, all figures are males.]

1. *Oliarus tantalus.* Fossette and base of frons (*Division B.*)
2. *Oliarus koanoa.* Fossette and base of frons (*Division B.*)
3. *Oliarus nubigenus.* Fossette and base of frons (*Division C.*)
4. *Oliarus immaculatus.* Fossette and base of frons (*Division D.*)
5. *Oliarus hevahera.* Fossette and base of frons (*Division E.*)
6. *Oliarus kulanus.* Fossette and base of frons (*Division E.*)
7. *Oliarus swezeyi.* Vertex, fossette, and base of frons (*Division A.*)
8. *Oliarus nubigenus.* Dorsal view of aedeagus.
9. *Oliarus acaciae.* Dorsal view of aedeagus.
10. *Oliarus opuna.* Dorsal view of aedeagus.
11. *Oliarus tamehameha.* Dorsal view of aedeagus.
12. *Oliarus myoporicola.* Dorsal view.
13. *Oliarus myoporicola.* Ventral view of pygofer, anal section and genitalia.



Hawaiian Cixiidae.

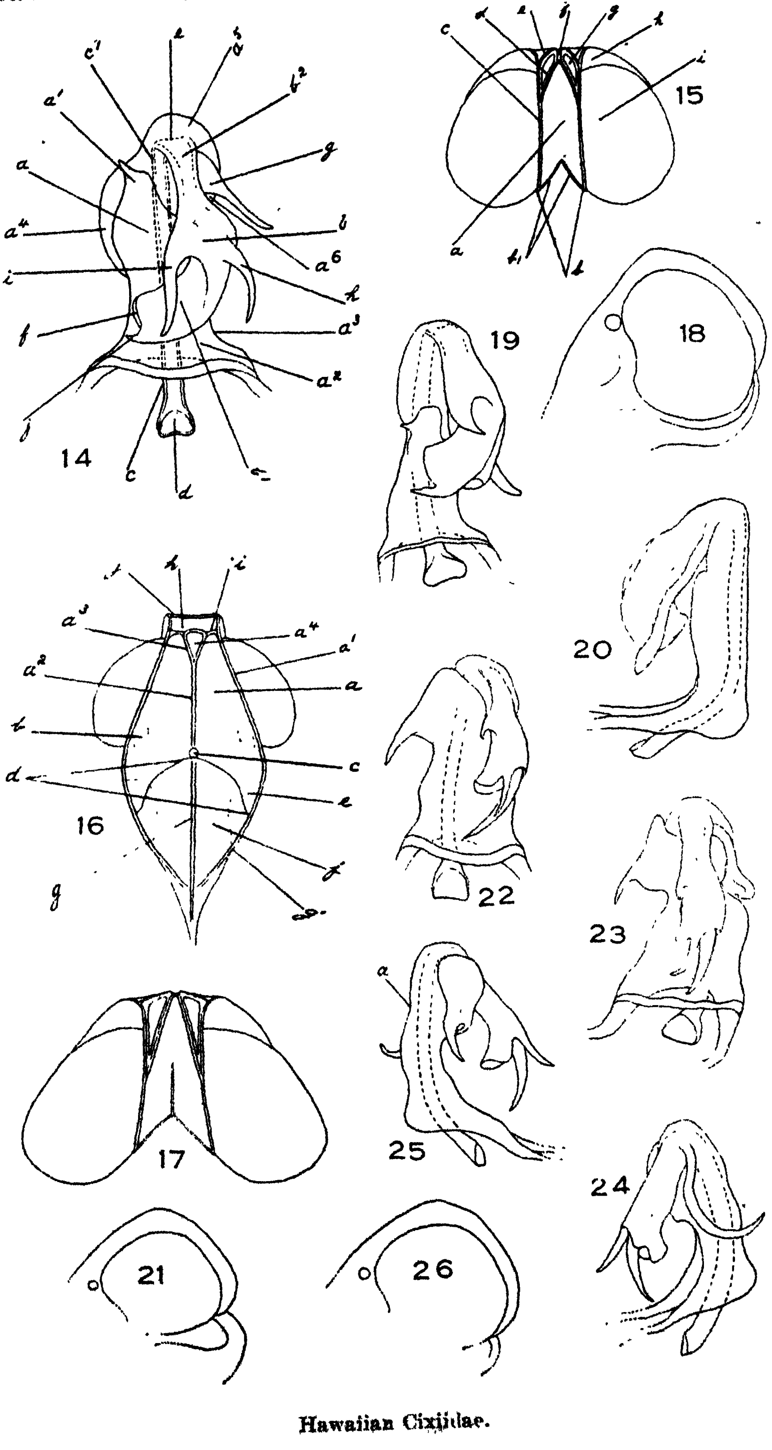
PLATE II.

14. *Oliarus acaciae.* Dorsal view of aedeagus showing:
 a, periandrium; *a1*, apex of periandrium; *a2*, base of periandrium; *a3*, side margin of periandrium; *a4*, *a5*, *a6*, membraneous portion of periandrium; *b*, phallus (more or less chitinized); *b1*, apical portion of phallus (mostly thin membrane); *b2*, basal portion of phallus; *c* and *c1*, apodeme of phallus; *d*, entrance of ejaculatory duct (duct may be attached by thin membrane to apodeme ?); *e*, conjunctiva; *f*, functional orifice; *g*, basal spur of phallus attached to membrane (behind); *h*, left median spur; *i*, right median spur; *j*, right apical spur.

15. *Oliarus swezeyi.* Dorsal view of head showing:
 a, vertex (which includes fossette); *b*, basal angles of vertex; *b1*, base of vertex; *c*, lateral carina of vertex; *d*, transverse carina of vertex; *e*, apical carina of vertex; *f*, median longitudinal carina of fossette; *g*, areolet (divided fossette); *h*, upper part of gena; *i*, eye.

16. *Oliarus euphorbiae.* View of frons and clypeus showing:
 a, frons; *a1*, lateral carina of frons; *a2*, medio-frontal carina; *a3*, fork of medio-frontal carina; *a4*, areolet of fork; *b*, fenestre; *c*, median ocellus; *d*, fronto-clypeal suture (apex of frons and base of clypeus); *e*, macula; *f*, clypeus; *g*, median carina of clypeus; *g1*, lateral carina of clypeus; *h*, fossette of vertex; *i*, apex of vertex; *j*, transverse carina of vertex.

17. *Oliarus walkeri* Stål. ♀ Dorsal view of head.
18. *Oliarus walkeri* Stål. ♀ Lateral view of head.
19. *Oliarus muiri.* Dorsal view of aedeagus.
20. *Oliarus muiri.* Lateral view of aedeagus.
21. *Oliarus muiri.* Lateral view of head.
22. *Oliarus swezeyi.* Dorsal view of aedeagus, slightly tilted dextrad.
23. *Oliarus swezeyi.* Dorsal view of aedeagus, tilted sinistrad.
24. *Oliarus swezeyi.* Lateral view of aedeagus from the left.
25. *Oliarus swezeyi.* Lateral view of aedeagus from the right; *a*, ventral surface of periandrium in profile.
26. *Oliarus swezeyi.* Lateral view of head.



Hawaiian Cixiidae.

PLATE III.

27. *Oliarus kaiulani.* Dorsal view of aedeagus.
28. *Oliarus kaiulani.* Ventral surface of periandrium in profile.
29. *Oliarus kaiulani* var. Dorsal view of aedeagus.
30. *Oliarus kaiulani* var. Lateral view of periandrium.
31. *Oliarus kirkaldyi.* Right genital style (three-fourths lateral).
32. *Oliarus tantalus.* Dorsal view of aedeagus.
33. *Oliarus tantalus.* Lateral view of aedeagus.
34. *Oliarus koanoa.* Dorsal view of aedeagus.
35. *Oliarus koanoa.* Ventral surface of periandrium in profile.
36. *Oliarus kirkaldyi.* Right genital style (rear side).
37. *Oliarus myoporicola.* Dorsal view of aedeagus.
38. *Oliarus myoporicola.* Ventral surface of periandrium in profile.
39. *Oliarus wailupensis.* Dorsal view of aedeagus.
40. *Oliarus wailupensis.* Ventral surface of periandrium in profile.
41. *Oliarus discrepans.* ♀ Lateral view of head.
42. *Oliarus kaumuahona.* Dorsal view of aedeagus.
43. *Oliarus kamuahona.* Ventral surface of periandrium in profile.
44. *Oliarus myoporicola.* Apodeme of genital styles (note abnormal tumid projection).
45. *Oliarus kirkaldyi.* Dorsal view of aedeagus.
46. *Oliarus kirkaldyi.* Ventral surface of periandrium in profile.
47. *Oliarus kirkaldyi.* Dorsal view of head.
48. *Oliarus discrepans.* ♀ Dorsal view of head.
49. *Oliarus kirkaldyi.* Right genital style (front side).

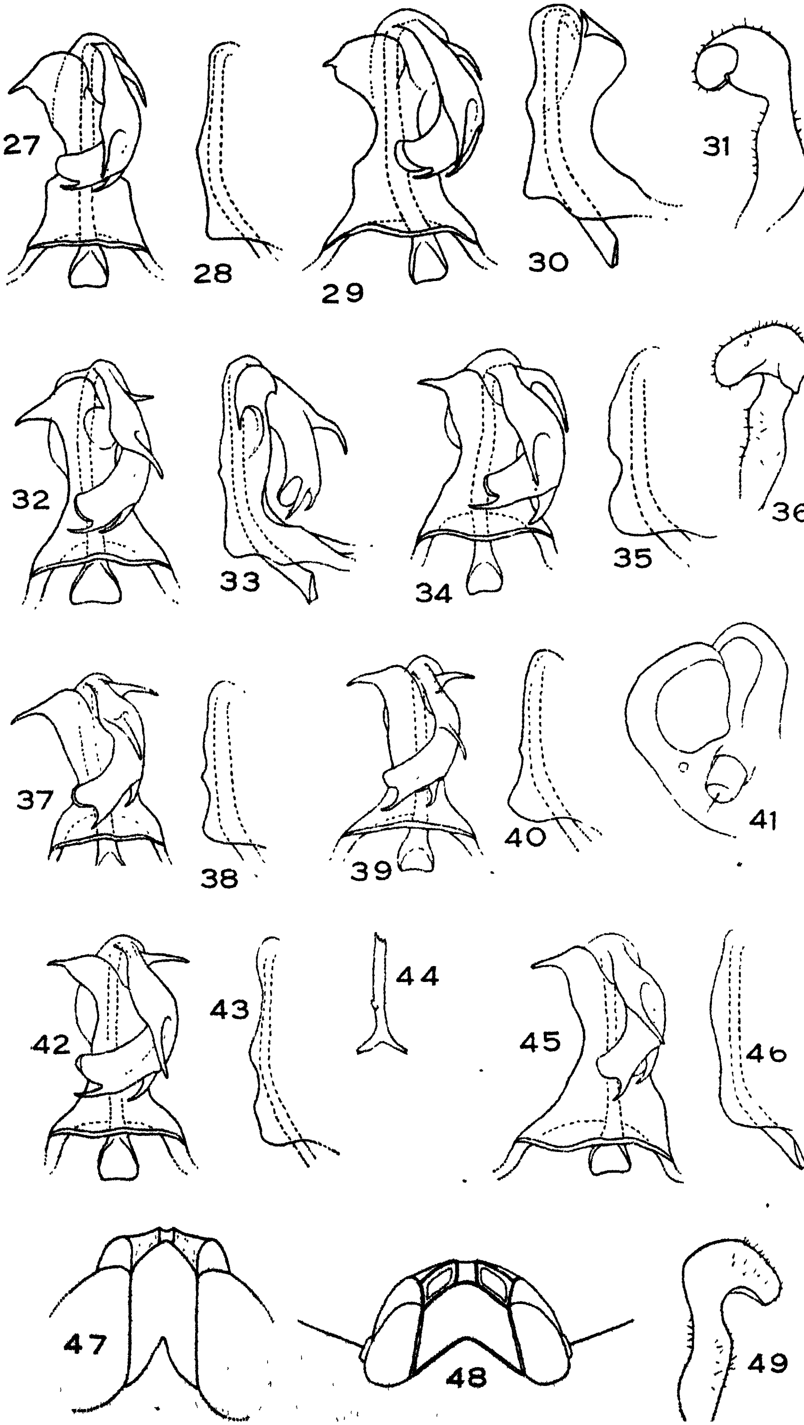

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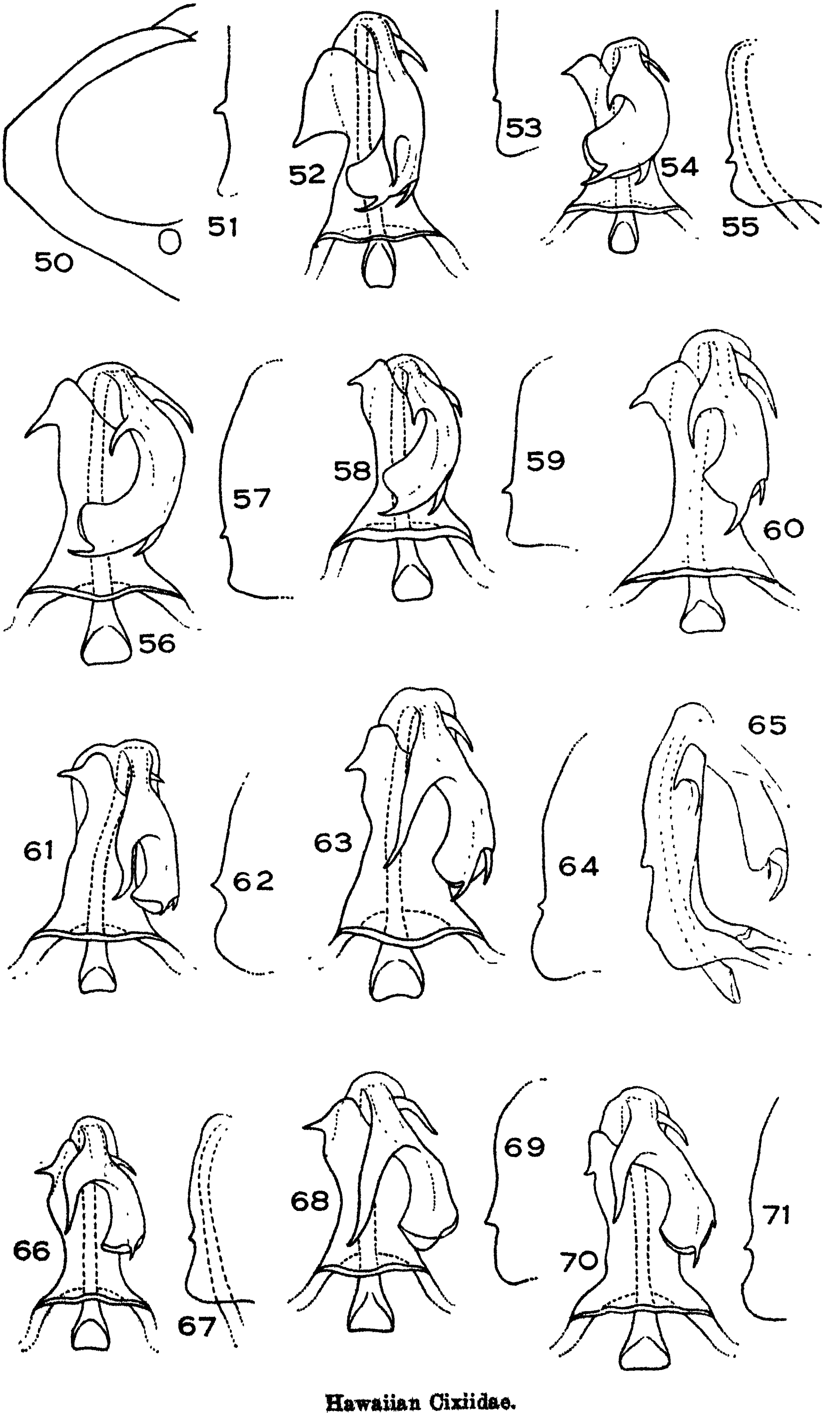
PLATE IV.

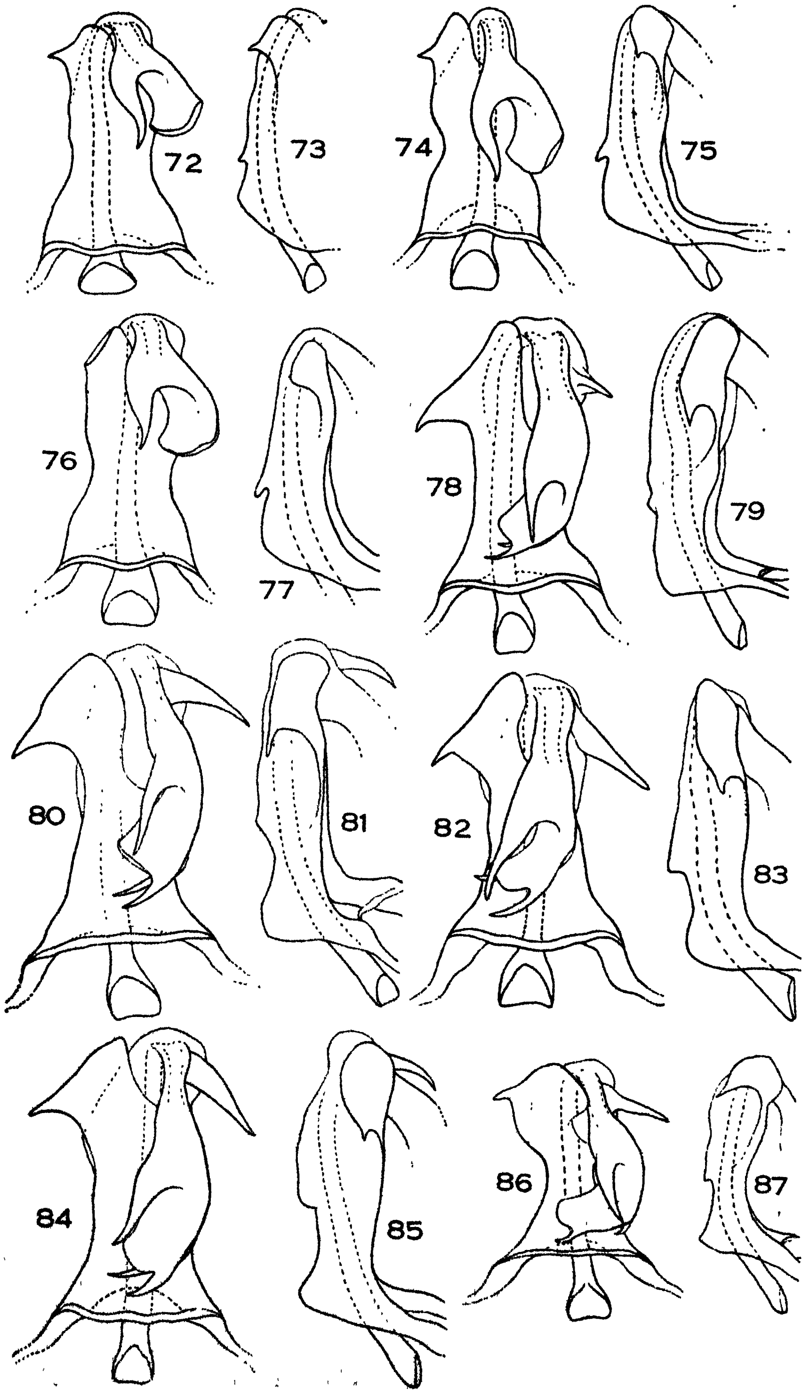
50. *Oliarus tamehameha.* Lateral view of head.
51. *Oliarus tamehameha.* Ventral surface of periandrium in profile.
52. *Oliarus nubigenus.* Dorsal view of aedeagus.
53. *Oliarus nubigenus.* Ventral surface of periandrium in profile.
54. *Oliarus makaala.* Dorsal view of aedeagus.
55. *Oliarus makaala.* Ventral surface of periandrium in profile.
56. *Oliarus pele.* Dorsal view of aedeagus.
57. *Oliarus pele.* Ventral surface of periandrium in profile.
58. *Oliarus likelike.* Dorsal view of aedeagus.
59. *Oliarus likelike.* Ventral surface of periandrium in profile.
60. *Oliarus immaculatus.* Dorsal view of aedeagus.
61. *Oliarus kaonohi.* Dorsal view of aedeagus.
62. *Oliarus kaonohi.* Ventral surface of periandrium in profile.
63. *Oliarus filicicola.* Dorsal view of aedeagus.
64. *Oliarus filicicola.* Ventral surface of periandrium in profile.
65. *Oliarus immaculatus.* Lateral view of aedeagus.
66. *Oliarus neotarai.* Dorsal view of aedeagus.
67. *Oliarus neotarai.* Ventral surface of periandrium in profile.
68. *Oliarus halehaku.* Dorsal view of aedeagus.
69. *Oliarus halehaku.* Ventral surface of periandrium in profile.
70. *Oliarus koele.* Dorsal view of aedeagus.
71. *Oliarus koele.* Ventral surface of periandrium in profile.



Hawaiian Cixiidae.

PLATE V.

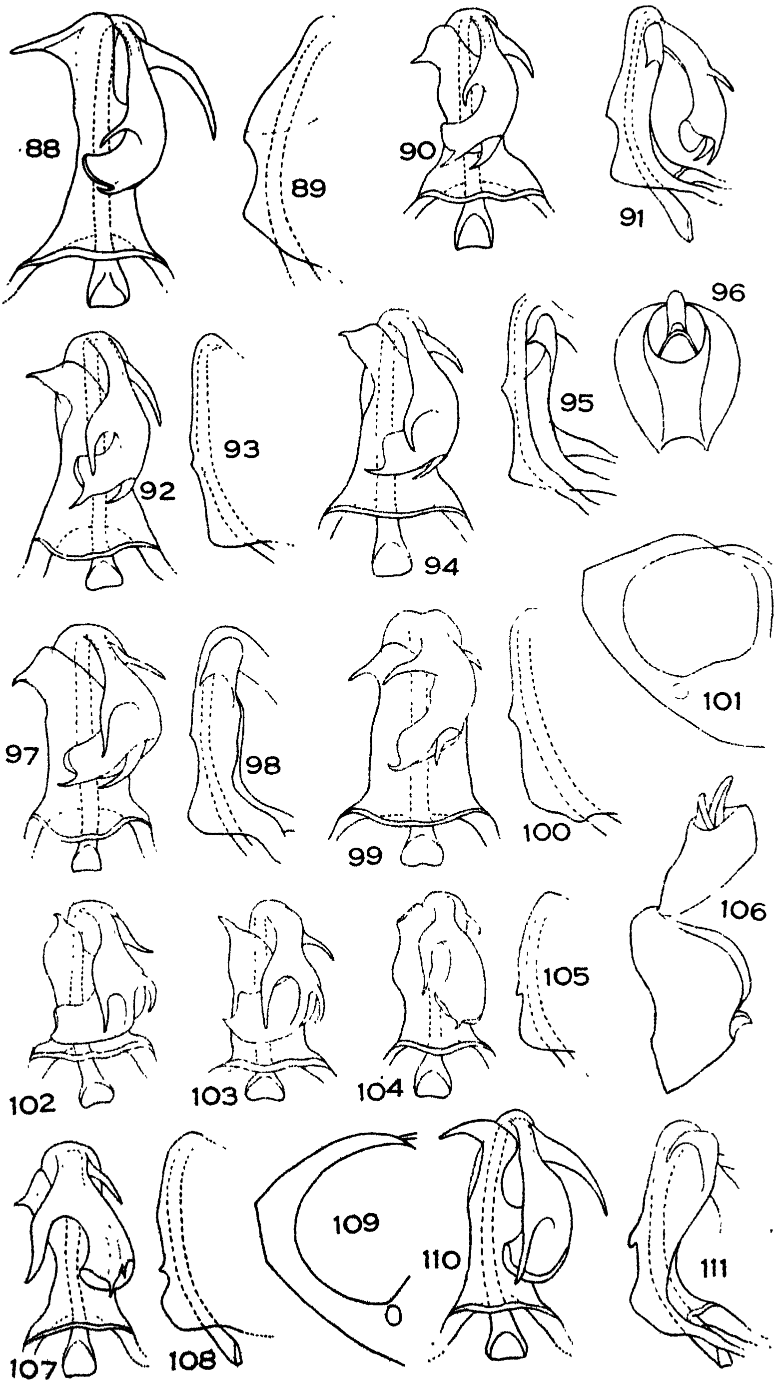
72. *Oliarus tarai.* Dorsal view of aedeagus.
73. *Oliarus tarai.* Ventral surface of periandrium in profile, slightly tilted to right.
74. *Oliarus tarai* var. Dorsal view of aedeagus.
75. *Oliarus tarai* var. Lateral view of periandrium.
76. *Oliarus morai.* Dorsal view of aedeagus.
77. *Oliarus morai.* Lateral view of periandrium.
78. *Oliarus olympus.* Dorsal view of aedeagus.
79. *Oliarus olympus.* Lateral view of periandrium.
80. *Oliarus lanaiensis.* Dorsal view of aedeagus.
81. *Oliarus lanaiensis.* Lateral view of periandrium.
82. *Oliarus haleakalae.* Dorsal view of aedeagus.
83. *Oliarus haleakalae.* Lateral view of periandrium.
84. *Oliarus hevaheva.* Dorsal view of aedeagus.
85. *Oliarus hevaheva.* Lateral view of periandrium.
86. *Oliarus montanus.* Dorsal view of aedeagus. (See Figure 125.)
87. *Oliarus montanus.* Lateral view of periandrium.



Hawaiian Cixiidae.

PLATE VI.

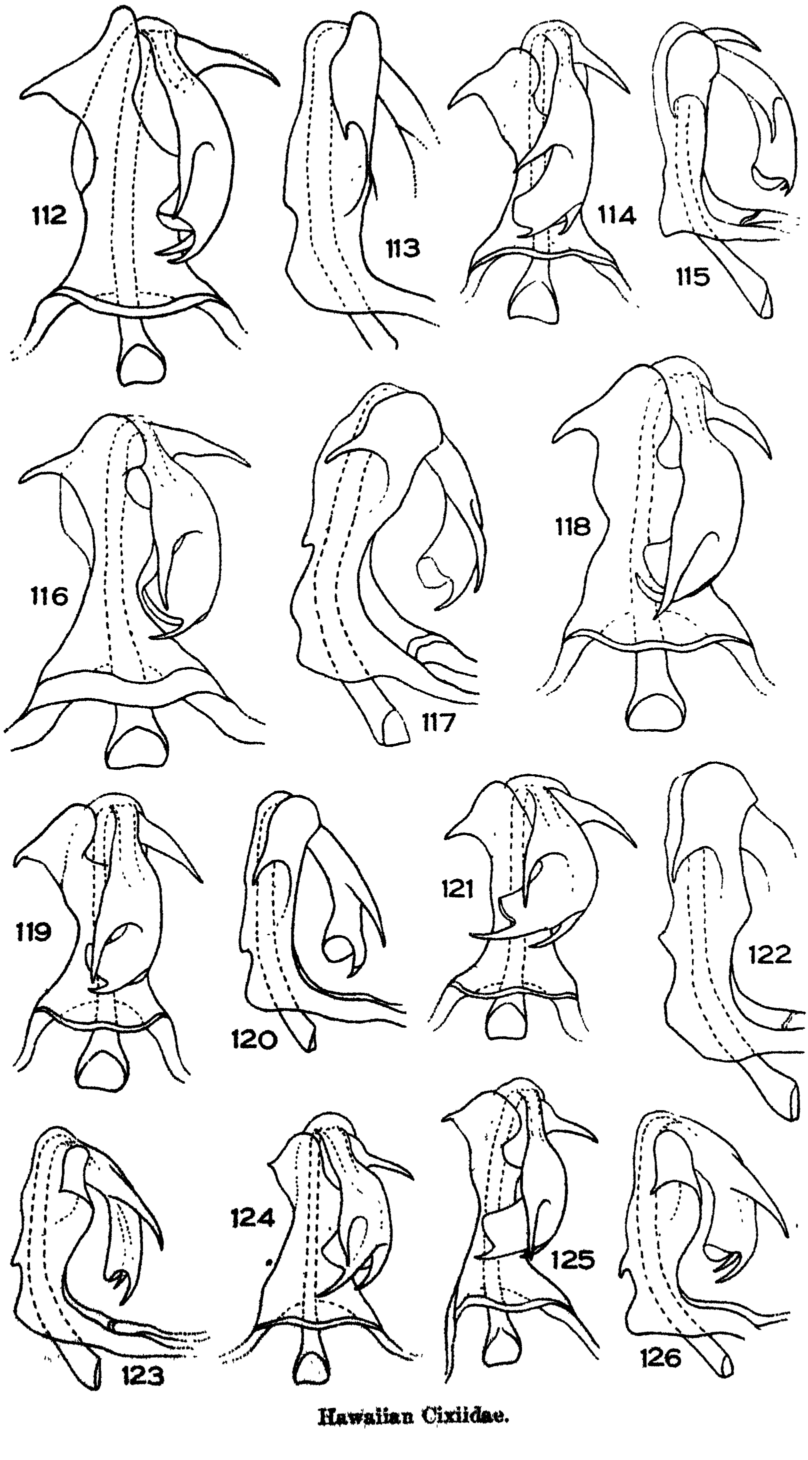
88. *Oliarus niger.* Dorsal view of aedeagus.
89. *Oliarus niger.* Ventral surface of periandrium in profile.
90. *Oliarus kauaiensis.* Dorsal view of aedeagus.
91. *Oliarus kauaiensis.* Lateral view of aedeagus.
92. *Oliarus waialeale.* Dorsal view of aedeagus.
93. *Oliarus waialeale.* Ventral surface of periandrium in profile.
94. *Oliarus lihue.* Dorsal view of aedeagus.
95. *Oliarus lihue.* Lateral view of periandrium.
96. *Oliarus niger.* Dorsal view of anal segment.
97. *Oliarus silvestris.* Dorsal view of aedeagus.
98. *Oliarus silvestris.* Lateral view of periandrium.
99. *Oliarus halemanu.* Dorsal view of aedeagus.
100. *Oliarus halemanu.* Ventral surface of periandrium in profile.
101. *Oliarus silvestris.* Lateral view of head.
102. *Oliarus euphorbiae.* Dorsal view of aedeagus.
103. *Oliarus koae.* Dorsal view of aedeagus.
104. *Oliarus albatus.* Dorsal view of aedeagus.
105. *Oliarus albatus.* Ventral surface of periandrium in profile.
106. *Oliarus immaculatus.* Lateral view of pygofer and anal segment.
107. *Oliarus agnatus.* Dorsal view of aedeagus.
108. *Oliarus agnatus.* Ventral surface of periandrium in profile.
109. *Oliarus olympus.* Lateral view of head.
110. *Oliarus inaequalis.* Dorsal view of aedeagus.
111. *Oliarus inaequalis.* Lateral view of periandrium.



Hawaiian Cixiidae.

PLATE VII.

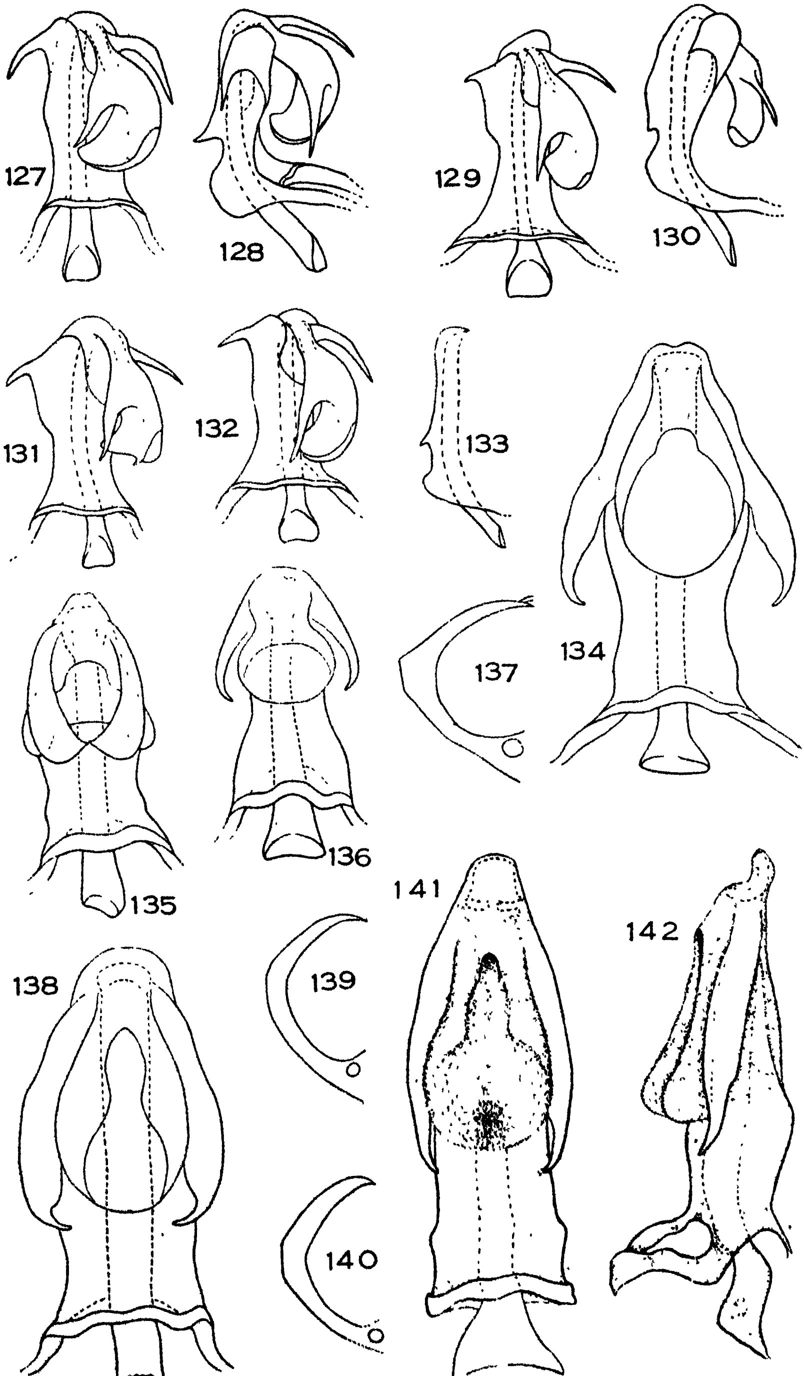
112. *Oliarus mauiensis.* Dorsal view of aedeagus.
113. *Oliarus mauiensis.* Lateral view of periandrium.
114. *Oliarus kanakanus.* Dorsal view of aedeagus.
115. *Oliarus kanakanus.* Lateral view of aedeagus.
116. *Oliarus kahavalu.* Dorsal view of aedeagus.
117. *Oliarus kahavalu.* Lateral view of aedeagus.
118. *Oliarus kulanus.* Dorsal view of aedeagus.
119. *Oliarus kaohinani.* Dorsal view of aedeagus.
120. *Oliarus kaohinani.* Lateral view of aedeagus (smaller specimen).
121. *Oliarus intermedius.* Dorsal view of aedeagus.
122. *Oliarus kulanus.* Lateral view of periandrium.
123. *Oliarus consimilis.* Lateral view of aedeagus.
124. *Oliarus consimilis.* Dorsal view of aedeagus.
125. *Oliarus montanus.* Dorsal view of aedeagus slightly dextrad. (See Figure 86.)
126. *Oliarus intermedius.* Lateral view of aedeagus.



Hawaiian Cixiidae.

PLATE VIII.

127. *Oliarus similis.* Dorsal view of aedeagus.
128. *Oliarus similis.* Lateral view of aedeagus.
129. *Oliarus instabilis.* Dorsal view of aedeagus.
130. *Oliarus instabilis.* Lateral view of aedeagus.
131. *Oliarus instabilis* var. f. Dorsal view of aedeagus.
132. *Oliarus inconstans.* Dorsal view of aedeagus.
133. *Oliarus inconstans.* Ventral surface of periandrium in profile.
134. *Iolania perkinsi.* Dorsal view of aedeagus.
135. *Iolania mauiensis.* Dorsal view of aedeagus.
136. *Iolania lanaiensis.* Dorsal view of aedeagus.
137. *Oliarus instabilis.* Lateral view of head (typical).
138. *Iolania oahuensis.* Dorsal view of aedeagus.
139. *Oliarus agnatus.* Lateral view of head.
140. *Oliarus filicicola.* Lateral view of head.
141. *Iolania koolauensis.* Dorsal view of aedeagus.
142. *Iolania koolauensis.* Lateral view of aedeagus.



Hawaiian Cixiidae.

Description of New Chalcid-Flies From Panama and Hawaii (Hymenoptera).

BY P. H. TIMBERLAKE
Citrus Experiment Station, University of California,
Riverside, California.

The types of the two new species of Encyrtidae from Panama, described below, are in the collection of the Hawaiian Sugar Planters' Station, and the types of the Hawaiian species are in the collection of the Hawaiian Entomological Society.

ENCYRTIDAE.

Zaplatycerus new genus.

This genus is closely allied to *Chrysoplatycerus* Ashmead, and differs in having the scutellum convex, distinctly punctured and without an apical fascicle of hair, and in having the stigmal vein distinctly shorter than the postmarginal and hardly curved.

Genotype: *Zaplatycerus fullawayi* n. sp.

Female. Head hemispherical, the occiput very slightly concave from side to side, the face with a deep semicircular scrobal impression as in *Chrysoplatycerus*; as seen from above, the head is rather broadly reniform, strongly rounded on the side, transverse in front between the eyes and slightly emarginately arcuate on the occipital border, which is almost acutely angled; as seen from the side, it is almost perfectly hemispherical in outline, but with a slight protuberance just below the eye, formed by the carina that bounds the scrobal impression; as seen from in front, the head is about as long as wide, the sides well rounded, but somewhat converging below toward the mouth, the oral margin rather strongly rounded, and the dorsal margin transverse. Eyes large, broadly oval, hardly perceptibly wider in the ventral half, almost touching the occipital margin posteriorly and with the inner orbits slightly diverging anteriorly; frontovertex nearly twice as long as wide, its width at the ocelli distinctly less than one-third the width of head, but more than one-fourth; ocelli rather large, arranged in an equilateral triangle, the posterior pair almost touching the eyes and a little more than their own diameter from the occipital margin. Cheeks as long as the width of the eyes, the genal suture delicate but distinct; face strongly convex between and below the antennae, the oral margin strongly arched; the deep semicircular scrobal impression bounded above by a sharp carina which ends abruptly in a slight prominence just below the anterior ends of the eyes and above the antennal

sockets (in *Chrysoplatycerus splendens* this carina extends opposite the lower margin of the antennal sockets); antennal sockets situated about midway between the ocular line and oral margin and rather far apart, the distance between them being about three times as great as their own length.

Antennae strongly laminately expanded; the scape extending far beyond the scrobal impression, its dorsal surface clavately expanding from base to apex, flat and at right angles with the inner surface, the latter enormously expanded, so that the greatest width near apex is somewhat more than one-half the length, but narrowing toward base; ventral margin of expansion nearly straight to near the apex, then strongly curved to the articulation with pedicel; outer surface of the scape also descending like a narrow ledge from the dorsal margin and forming a concavity for the reception of the pedicel; pedicel longer than any of the following funicle joints, flattened on the dorsal margin like the scape and produced ventrad in a long, curved process, forming a concave apical surface for the reception of the funicle; flagellum in form of an oval, laminate mass about thrice as long as wide, the vestiture consisting of very fine short hairs rather dense but inconspicuous, funicle six-jointed, each joint strongly transverse, the dorsal arm of each, except of the first joint, longer than the ventral arm, the dorsal margin of the joints increasingly longer distad, and the ventral margin of each joint ending in an acute recurved point; club solid, subtriangular, but rounded at apex, the base and ventral sides subequal and about one-fourth longer than the dorsal side. Mandibles narrow in frontal view with two acute teeth at apex, of which the inner one is considerably the larger; on inner margin at base of the second tooth is a very slight angular protuberance, thus faintly indicating a third tooth. Palpi short, rather stout; maxillary pair four-jointed, first two joints somewhat longer than wide, subequal, both increasing in width toward apex, third joint shorter, no longer than wide, the fourth joint about as long as first two joints combined, oval, but rather acutely pointed at apex; labial pair very short and three-jointed, basal joint about as long as wide, the second nearly twice as wide as long, and the third about twice as long as wide and rounded at apex.

Thorax very robust, about one-third longer than wide and as thick dorso-ventrally as wide; pronotum very short, strongly arcuate, almost wholly concealed in dorsal view of insect; mesonotum strongly convex both anteroposteriorly and from side to side; mesoscutum not quite twice as wide as long, its posterior margin nearly straight; axillae not elevated above scutellum, rather large, about one-half as long as wide, and not quite meeting medially; scutellum very convex and almost tectiform toward apex, with a slight median carina from apex nearly to the middle and with a fine, grooved, median line at base, the sides strongly declivous in a curve, the apex acute and reaching to the base of the propodeum; metanotum reduced to two obliquely placed side pieces somewhat triangular in shape; propodeum with a dorsal and an obliquely declivous posterior surface, the former part divided medially by the apex of scutellum, each lateral por-

tion very acute medially and greatly lengthening toward sides, the anterior margin curving forward considerably in front of the apex of scutellum; propodeal spiracles small, nearly circular, placed in the angle between anterior and lateral margin and very close to both margins. Prepectal plates thin, rather large and somewhat overlapping the mesopleura; the latter obliquely truncate on posterior margin; metapleura extraordinarily large, subquadrangular, but only one-half as long ventrally as on dorsal margin.

Abdomen much as in *Chrysoplatycerus*, but shorter and wider across the base, being as wide as the thorax and about two-thirds as long, hardly longer than wide, the dorsum deeply sunken in behind the first tergite, the venter compressed and strongly tectiform, the ovipositor enclosed by the ventrites and barely protruded at apex.

Legs normal, slightly longer than in *Chrysoplatycerus*, the middle tarsi only slightly tapering toward apex and stouter than the cylindrical hind tarsi; spur of middle tibiae nearly as long as the basal joint of the tarsus. Wings normal in size and shape; costal cell wide, mostly bare, but finely setose along the external margin; marginal fringe very short and dense; discal pubescence fine and dense, but coarser in basal area; speculum very wide, extending obliquely from apex of submarginal vein nearly to opposite margin, but obscured by about five rows of setae on the reverse side of disk; base of wing with a large triangular bare area, enclosed by a row of setae next to the vein and by several rows next to the speculum and partly enclosed on outer side by two rows of finer setae placed considerably in from the margin; submarginal vein not quite reaching to the middle of the costal margin and not thickened distad; marginal vein punctiform; stigmal vein moderately long, nearly straight, but with a beak-like expansion at apex directed toward the costal margin; postmarginal vein slender and distinctly longer than the stigmal. Hind wings rather wide, the disk almost completely pubescent, the marginal fringe somewhat longer than in the fore wing, the costal cell not very wide but reaching distinctly to the hooklets.

Frontovertex and mesonotum with a very fine delicate reticulation, the frontovertex also with sparse fine punctures which become distinctly longer in the ocellar region; mesonotum with numerous fine punctures which are about equally close on scutum, axillae and most of the scutellum, but become much sparser at apex of scutellum; scrobal impression of face smooth and polished, the prominence between the antennae subrugulosely reticulate, the lateral margins of face more delicately reticulate; cheeks moderately finely reticulate and rugulose behind the genal suture; propleura, prepectal plates, tegulae, and metapleura about as finely reticulate as the cheeks, but hardly rugulose; mesopleura smooth except on ventral margin posteriorly, where they are delicately lineolate and partly reticulate; abdomen smoother and more shiny than notum of the thorax, but delicately reticulate on sides of first tergite and distinctly reticulate on ventral surface of the same segment. Pubescence very fine, dark-colored and incon-

spicuous, sparse on the head, rather dense and retrorsely appressed on the mesonotum, the apex of scutellum without any longer bristle-like setae; abdomen nearly bare; the eyes bare. Coloration submetallic fuscous.

Male. Similar to the male of *Chrysoplatycerus*,* but it differs, as follows: Head a little thicker fronto-occipitally; frontovertex a little longer than wide, the posterior ocelli about their own diameter from the margin of the eyes and occiput; eyes somewhat larger, more triangular in outline, with distinctly longer, denser pubescence; face no wider than long, the scrobal impression subcircular, not extending outward much beyond the lines indicated by the inner orbits of eyes, divided in the inferior half by the triangular extension of the facial prominence, and in the superior half by a carina-like continuation of the prominence; the antennal sockets about equidistant from the nearest point of the eye and from the clypeal margin.

Antennae somewhat shorter; scape reaching slightly beyond the scrobal impression, compressed and somewhat expanded beneath; pedicel no longer than thick; flagellum cylindrical, distinctly thicker than the pedicel, densely clothed with short antrorse setae; funicle six-jointed, each joint discoid, about twice as broad as long; club nearly as long as the last three funicle joints combined, gradually tapering to the somewhat rounded apex.

Thorax more robust, thicker dorsoventrally and convex anteroposteriorly, as well as from side to side; the axillae longer and much less acute medially, the scutellum much less rounded at apex; thorax very much also as in the female, except that the scutellum is more depressed on disk, much more abruptly declivous at sides and apex, and without a median carina toward the apex. Abdomen depressed, somewhat concave above, slightly broader than thorax, about two-thirds as long and subtriangular in outline, with the basal angles rounded and the apex truncate.

Legs not differing markedly from the female or the male of *Chrysoplatycerus*. Wings nearly as in the male of *Chrysoplatycerus*, but the marginal vein punctiform; similar to wing of female, but hyaline, more triangular in shape, the stigmal vein somewhat shorter, straight and not enlarged at apex, and the bare area at base of disk smaller.

Cheeks exterior to the genal suture, frontovertex and notum of thorax rugulosely reticulate, the sculpture of other parts of body about as in the female, differing from male of *Chrysoplatycerus*, especially in having the face much less smooth and polished, the notum more rugulose, the pleura in part reticulate. Pubescence much denser than in the male *Chrysoplatycerus*, but not conspicuous on account of its dark color. Coloration slightly metallic black, and with no parts of the body brilliantly metallic.

Zaplatycerus fullawayi n. sp. Figure 1.

Female. Head metallic fuscous, with a moderately strong greenish luster changing to purplish-blue on the facial prominence; antennae black with

* Cf. Proc. U. S. Nat. Mus., Vol. 61, Art. 2, p. 2, 1922.

a moderately strong greenish luster, most brilliant on the scape; thorax and abdomen brownish fuscous, very nearly metallic, and with a slight greenish luster, most evident on the sides of the scutellum, although the sides of the basal segment of abdomen (meaning the more dorsal part of that portion of the tergite that is reflexed on to the venter) have rather a brilliant golden and reddish-purple luster; legs brown, but with the tarsi, apex of middle tibiae and tibial spur yellowish; the apex of front tibiae, apical half of middle and hind femora, especially toward ventral margin, also somewhat yellowish; wings subfuliginous, the infuscation gradually fading toward apex of disk and relieved by a small hyaline spot beneath the juncture of submarginal and stigmal veins and by a curved hyaline streak, not quite parallel with the posterior margin, extending from the speculum to about opposite the middle of the stigmal vein and placed somewhat more than one-third of the width of disk in from the posterior margin; hind wings faintly fuliginous.

Length of body, 1.50; length of head, 0.567; width of head, 0.643; thickness of head fronto-occipitally, 0.321; width of vertex at anterior ocellus, 0.183; length of antenna, 1.294; width of scape, 0.305; width of mesoscutum, 0.682; length of fore wing, 1.514; width of fore wing, 0.623 mm.

Male. Frontovertex with numerous short, erect, well-scattered setae; eyes rather densely pubescent, the setae erect and nearly as long as those on the frontovertex; short retrorse setae on mesonotum similar to those of female, but relatively denser, those on the scutellum becoming gradually a little longer toward apex and erect at the extreme apex.

General color nearly black, with the frontovertex and mesonotum rather dull on account of the rugulose sculpture; the face, cheeks, and pleura shining, but not highly polished and with a slight greenish luster on the face and metapleura; abdomen somewhat shiny black; mandibles reddish; antennae dull blackish; legs blackish, somewhat shiny, with all the tarsi, apex of middle tibiae and spur brownish-yellow; wings hyaline, the veins and pubescence of the disk dusky.

Length of body, 1.36; length of head, 0.505; width of head, 0.568; thickness of head fronto-occipitally, 0.272; width of frontovertex, 0.215; length of antenna, 0.778; width of mesoscutum, 0.606; length of fore wing, 1.241; width of fore wing, 0.584 mm.

Described from three females (holotype and paratypes), Canal Zone, Panama, April, 1924, and one male (allotype), New Providence, Panama, May 11, 1924, all reared by Mr. Fullaway from *Pseudococcus brevipes* (Cockerell) (*bromeliae* Authors). One of the females is in poor condition, as it is a mere shell with mouth parts and abdomen lost.

Type No. 1247, Hawaiian Sugar Planters' Experiment Station.

Chrysopophilus new genus.

Closely allied to *Isodromus* Howard, but differing in having the head longer than wide and strongly, hemispherically convex, the face without scrobes, the hind tibiae laminately expanded, and the abdomen small and very much compressed.

Genotype: *Chrysopophilus compressiventris* n. sp.

Female. General form slender, much less robust than in *Isodromus;* head much longer than wide, a little narrower than thorax, about two-thirds as thick fronto-occipitally as wide, hemispherical in shape, with curvature, as seen from side, nearly uniform from occipital margin to the mouth; as seen from in front, well rounded above, the cheeks somewhat converging in a straight line to the broad, truncate oral margin; occipital surface of head well exposed above, almost flat, the neck inserted near the middle, the marginal angle at vertex about rectangular; eyes moderate in size, irregularly oval, broader at lower end and well separated at dorsal end from the occipital margin; vertex somewhat less than one-third as wide as whole head, the space between eyes seen in dorsal view of head about twice as long as wide, the inner orbits of eyes moderately diverging posteriorly; ocelli in an equilateral triangle, the posterior pair contiguous to the eyes and remote from the occipital margin; cheeks moderately long and about equal to width of eyes; face convex, without scrobes, the antennal sockets large, subtriangular, their inner margin straight and parallel, their anterior margin almost touching the oral margin, and the distance between the sockets about equal to their length. Antennae as in *Isodromus*, but a little longer and slenderer. Mandibles tridentate at apex, the two outer teeth acute, the inner tooth truncate, but not very wide, and thus nearly as in *Isodromus iceryae* Howard, which has the inner tooth more broadly truncate. Palpi short; maxillary pair three-jointed, the basal joint a little more than twice as long as thick, the middle joint the widest, shortest and about one-half longer than wide, the third joint about as long as the first, but slender, cylindrical, and at its apex provided with a minute conical nipple, which may represent a fourth joint; labial palpi three-jointed, the basal joint nearly thrice as long as wide, the middle joint very small and transverse, the third not quite as thick as the basal joint and somewhat less than one-half as long.

Thorax twice as long as wide, attaining its greatest width across the propodeum; pronotum large, conical, well exposed, its posterior margin arcuate; mesoscutum moderately convex from side to side, hardly more than one-third broader than long; axillae large, depressed, broadly meeting medially as in *Isodromus*; scutellum somewhat shorter than the mesoscutum, acute at apex, the disk depressed to a little beyond the middle, then strongly roundingly declivous to the apex and toward the sides, the depressed part of scutellum, together with the axillae, forming a nearly equilateral triangle; propodeum large, rather strongly declivous posteriorly, by

no means short medially, yet fully twice as long at the sides as at the middle; metapleura very small, the metepimeron visible as a narrow sclerite between metapleura and mesopleura.

Abdomen small, laminately compressed, very much narrower, therefore, than the thorax and about two-thirds as long; cercal plates not retracted toward the base, but situated close to the apex; apical ventrite keel-like, strongly produced beyond apex of tergum; ovipositor normally enclosed by the ventrites, but the naked spicula is exposed in one specimen.

Wings long and narrow or about three times as long as wide; discal setae dense, but the basal area largely bare, marginal fringe short but dense; speculum very narrow above, expanding into a large hairless area at middle of disk and connecting with basal hairless area at the posterior margin of wing; submarginal vein straight, not enlarged distad; marginal vein about twice as long as wide, the postmarginal somewhat shorter than the marginal; stigmal vein very slender, hardly expanded at apex, forming a very acute angle with the postmarginal and somewhat longer than marginal and postmarginal veins combined.

Middle and hind legs very long, the front and middle pair very slender and cylindrical, the hind pair compressed, but with the femora, however, not much wider than in related genera, the tibiae, on the other hand, laminately expanded on outer (or dorsal) margin; hind tarsi about two-thirds as long as middle tarsi and slightly tapering; middle tarsi very long, nearly as long as middle tibiae, distinctly tapering, yet not much thickened basad, the basal joint almost as long as the last four joints combined; spur of middle tibiae very long and slender, yet not quite as long as the first joint of the middle tarsus.

Head with fine, close, reticulate, nearly round punctures, and with a few very shallow pin-punctures on the frontovertex; mesonotum rather shiny and with a very minute, uniform scaly reticulation; propleura and prepectal plates like the notum, the mesopleura very finely longitudinally reticulate and largely lineolate in the middle; propodeum and abdomen smooth. Pubescence sparse throughout; dorsal surface of head and the eyes practically bare, the face and cheeks with a few fine, short, whitish setae; pronotum with much longer rather numerous setae, pale brownish in color arranged mostly in transverse rows over the whole surface; mesoscutum, axillae, and scutellum with similar, but sparse setae; lateral margin of propodeum and the metapleura bare, without the dense, silvery-white pubescence found in other genera of the *Homalotylus* group; metepimera and outer surface of hind coxae, however, with moderately dense, white, appressed pubescence; abdomen bare, except on the keel-like hypopygium. Coloration non-metallic; the antennae unicolorous.

Male. Not known.

Chrysopophilus compressiventris n. sp. Figures 2 and 3.

Female. Head brown, the antennae a little paler yellowish-brown; thorax in large part and abdomen, except the base, piceous and with the

hypopygium brownish; propleura, front and hind coxae and base of abdomen yellowish-white, the prepectal plates brownish; remainder of front legs, apical half of middle tibiae and middle tarsi yellowish-brown and about concolorous with antennae; middle coxae piceous, the middle femora and basal half of middle tibiae fuscous, the femora at apex and in a very narrow ring close to the base paler or yellowish-brown; hind trochanters brownish, the hind femora, tibiae and basal joint of tarsi piceous; remainder of hind tarsi pale brownish-yellow, but the last joint of both the middle and hind tarsi brownish above and piceous at apex; wings nearly hyaline, with a large oval fuscous spot suspended from the marginal and stigmal veins, extending two-thirds of distance to the posterior margin and separated by a slender longitudinal hyaline streak from a much smaller fuscous spot on the posterior margin directly opposite the marginal vein; extreme base of disk with a small fuscous streak next to the posterior margin; veins pale fuscous, the marginal and postmarginal veins darker; hind wings wholly hyaline, the discal setae on the basal half becoming nearly invisible when the wing is mounted in balsam, those on apical half remaining distinct.

Length of body to apex of hypopygium (2.03 to) 2.06; length of head, 0.550; width of head, 0.457; thickness of head, fronto-occipitally, 0.307; width of vertex at posterior ocelli, 0.168; length of antenna, 1.135; width of mesoscutum, 0.524; length of fore wing, 1.555; width of fore wing, 0.515 mm.

Described from two females (holotype and paratype), reared from a *Chrysopa* cocoon, Canal Zone, Panama, March, 1924 (Fullaway).

Type No. 1248, Hawaiian Sugar Planters' Experiment Station.

APHELINIDAE.

Marietta graminicola n. sp. Figures 4 and 5.

This species occurs in two forms, one with the wings fully developed and one with the wings reduced to small scales. The latter differs also in having tergum of abdomen much less concave or even convex, alternately banded with whitish and fuscous, and I considered at first that it was probably distinct from the macropterous form. As the two forms are found together in grass infested with *Trionymus insularis* Ehrhorn, on which they are secondary parasites, and agree in many other respects, I now believe that they are forms of one species. The species differs from most of its allies, in having the wings (of macropterous phase) narrower than usual, and the scape unusually short and broad. It agrees in this respect with *M. zebra* (Kour-

dumoff), from which it differs (in the macropterous phase) in the details of the wing pattern and in having no setigerous punctures on the frontovertex.

Macropterous Phase.

Female. Head thin fronto-occipitally and held vertically; eyes rather large, and after the head has collapsed in dry specimens their anterior ends are drawn close together, causing the vertex to appear triangular; ocelli small, in a nearly equilateral triangle, the posterior pair placed slightly closer together than the distance from either to the anterior ocellus and close to the margin of the occiput and of the eyes; cheeks somewhat shorter than the width of the eyes; antennae inserted moderately far apart, close to the oral margin; scape short and broadly expanded beneath, widest considerably beyond the middle and excluding the radicle distinctly less than twice as long as wide; pedicel nearly thrice as long as wide and somewhat less than one-half as long as the scape proper; the two funicle joints small, transverse, ring-joint-like, and not as wide as the pedicel or the following joint, the first joint rather smaller than the second; basal joint of the club nearly as long as the pedicel, nearly twice as long as wide, and somewhat less than one half as long as the following joint; apical joint of the club somewhat wider toward the base than the preceding joint and pointed at apex.

Thorax about one-half longer than wide and only slightly convex from side to side; pronotum slightly wider than the mesoscutum, with an abruptly declivous anterior face, the collar very short, transverse, lengthened at the sides, the posterior margin slightly arcuate between the lateral expansions and again at each side; mesonotum somewhat more than twice as wide as long; axillae as long as wide; scutellum much broader than long and broadly rounded at apex; metanotum arcuate, with the sides curved forward, the length at the middle nearly one-third the length of scutellum and its surface level with scutellum; propodeum about as long as the metanotum, the slightly raised triangular area at the middle equilateral; mesopleura hardly longer than wide, convex and strongly oblique above on the posterior margin. Abdomen almost as wide as thorax and about as long as the thorax and head combined, rapidly narrowing from a little behind the middle to the rather acute apex; tergum usually more or less concave; ovipositor shortly protruded at apex.

Legs normal for genus; middle tarsi shorter than the tibia, slightly tapering, the basal joint longest, nearly one-half larger than the second joint and slightly longer than the tibial spur. Wings three times as long as wide; marginal vein about one-third longer than the submarginal vein.

Head and dorsum of thorax dull and alutaceous, with microscopic reticulations; pleura, propodeum, except medially, and the abdomen smooth, the depression of the tergum rather polished. Head, including eyes, apparently wholly bare; mesonotum with long, sparse, retrorse, whitish setae, of

which there are usually two pairs on scutellum and one seta on each axilla; collar of pronotum and sides of abdomen with similar setae.

Head and thorax in dry specimens about warm buff to buff-yellow (Ridgway), but due to post-mortem changes sometimes appearing more or less deeply flesh-colored; mesonotum with a few scattered, minute, fuscous dots, generally but not always encircling the base of the setae, there being usually three pairs of these dots on the scutellum; underparts of the thorax paler or about creamy-white; cheeks with a delicate fuscous oblique line, not quite parallel with the posterior margin of the eye and just barely crossing the genal suture anteriorly; color of abdomen in general about like that of the thorax, the concave, smoother part of the tergum yellowish or often more or less fuscous; the lateral margin and reflexed ventral part of the tergites more or less whitish and marked with five narrow, transverse, wavy, fuscous bands, which at the middle of the reflexed part of tergites are more or less united by an irregular, longitudinal, fuscous streak or series of streaks; basad of the first transverse band there are also two fuscous dots on the lateral margin of the first tergite; ventrites, which are visible only on apical part of abdomen, yellow; ovipositor yellowish, changing to piceous at apex. Scape, pedicel, and basal joint of club creamy-white; the scape proper with a single, oblique, narrow fuscous band reaching from close to dorsal margin near base to the ventral margin at a point slightly beyond the widest part, but the band sometimes faint or absent; basal half of pedicel on dorsal side, the two funicle joints, base of first joint of club narrowly below, but including about half the length dorsally, and a little less than basal half of the apical joint of club, fuscous; remainder of apical joint of club yellowish. Legs concolorous with underparts of thorax and marked with narrow, fuscous, more or less oblique annuli, as follows: Front and middle femora and tibiae and hind tibiae each with three rings, one of the rings of the front tibiae at extreme apex, the same part of the middle and hind tibiae with a more or less distinct additional ring; hind femora with four oblique rings, of which the two basal rings are more or less irregular and frequently either branching or splitting up into several dots on the outer surface; knee-joint of hind legs also with a minute fuscous dot; tarsi and spur of middle tibiae pale, except that the last joint of tarsi is fuscous. Wings whitish, marked with a fuscous pattern as shown in figure; although there is considerable individual variation, the two more or less circular, often unequal-sized, clear areas beneath the stigmal vein, and the three more or less triangular, clear areas arranged around the apex of the disk, are characteristic; the stigmal vein and the end of the two rays on costal margin of disk beyond the venation are darker than other parts of the pattern.

Length of body to apex of ovipositor, (0.793 to) 1.25; length of head, 0.371; width of head, 0.396; length of antenna, 0.519; length of scape, including radicle, 0.209; width of scape, 0.111; width of mesoscutum, 0.366; length of fore wing, 1.019; width of fore wing, 0.364 mm.

Male. Very similar to the female in structure and coloration, except as follows: Club entire, wider than in female, or about as wide as the scape and widest near the middle; abdomen hardly longer than wide, broadly rounded at apex, a little wider and shorter than the thorax, depressed, hardly concave and wholly yellowish above; wings relatively smaller.

Length of body, (0.625 to) 0.822; length of head, 0.320; width of head, 0.320; length of antenna, 0.448; length of scape, including radicle, 0.165; width of scape, 0.092; width of mesoscutum, 0.285; length of fore wing, 0.822; width of fore wing, 0.269 mm.

Brachypterous Phase.

Female. Differs from the macropterous phase in having the thorax no longer than wide, but with the proportionate lengths of the different sclerites about the same; the propodeum without a median triangular raised area; abdomen with a distinct tendency not to become concave above after drying; wings very small and reaching about to the base of the abdomen, about two and one half times longer than wide, hyaline and with a submarginal vein running nearly the whole length of the disk. Coloration similar, but the narrow fuscous lines on abdomen are continued across the tergum, which is otherwise largely greyish-white except around the margin; basal tergite with three fuscous dots in a line on each side near basal corners, and a fuscous cross-line at the apical third, produced medially as a longitudinal line to the base, and more or less strongly biarcuate on each side of the middle; four following tergites similar but the fuscous line is often not continued medially towards the base, and in some specimens about two dots on each side along basal margin of the segments are visible, but these are often concealed by the preceding segment; the sixth tergite with an inverted T-shaped fuscous mark, with the transverse arms longer than the median bar and curved forward a little at the ends, the base of the segment with two dots on each side; seventh tergite yellowish and with an oval depression on the lateral margin toward the base, just behind the cercus, and this depression is usually more or less dusky or fuscous; apical margin of the tergites behind the fuscous line more silvery-white than elsewhere; ventral surface of abdomen about as in the macropterous phase.

Length of body to apex of ovipositor, 0.582 to 0.939 mm.

Male. Similar to the brachyterous female, with the usual sexual differences; abdomen in some specimens convex above, with the segments contracted and each tergite nearly covering the fuscous transverse line of the following segment, so that the general effect is produced of a more intense silvery-white surface; in one specimen the segments are extended, and three pairs of fuscous dots are visible on each side of the basal part of the tergites, of which the middle dot on each side is often connected with the transverse line; the sixth tergite differs from the female, in having

a pair of fuscous dots on each side and in the middle a longitudinal fuscous line that has no distinct, transverse arms at apex of segment.

Length of body, 0.644 to 0.775 mm.

Described from fifty-one females and eighteen males (holotype female, allotype and paratypes), all macropterous and reared from *Trionymus insularis* Ehrhorn collected at Kahuku, Oahu, July 18, 1919 (Swezey); one brachypterous female (paratype) reared with the above; seven females and one male (paratypes) of macropterous phase, and five females and three males (paratypes), of the brachypterous phase, reared from *Antonina indica* Green at Honolulu, May to July, 1919 (Timberlake); four females (three of them brachypterous) and two males reared from grass at Kaimuki, Oahu, March 8, 1913 (Swezey); two females (paratypes) of brachypterous phase reared from *Trionymus insularis*, Kaimuki, Oahu, June 28 and 30, 1919 (Swezey); two females (paratypes), one brachypterous, reared from Bermuda grass, Honolulu, June 14 and 16, 1919 (Timberlake); and two females and two males (paratypes), all brachypterous, swept from Bermuda grass at Waikapu, Maui, March 23, 1924 (Swezey).

Lelapinae.

The Lelapinae form one of the few groups of the Chalcidoidea represented in the autochthonous fauna of Hawaii. The species are rather numerous, but not very commonly taken, and this is especially true of some of the larger species like those described below. I should include in this group also those species described by Ashmead in the genera *Toxeuma* and *Sticto-mischus*. The Hawaiian Lelapinae all differ from the neotropical *Lelaps*, in having the pubescence of the head soft, fine, and short instead of being very coarse and rigid, the antennae at most moderately long, with the first funicle joint not especially elongate, the wings much shorter and broader, and the abdomen usually much less conically produced at apex.

Calolelaps new genus.

Calolelaps differs from *Neolelaps* Ashmead, in having the antennae somewhat shorter, the stigmal vein considerably more knobbed at apex as compared with Ashmead's figure of *Neole-*

laps, the petiole of abdomen much longer, the second tergite of abdomen about one-third as long as the gaster, and in having the following tergites not greatly unequal.

Genotype: *Calolelaps basalis* n. sp.

Female. Head rather thin fronto-occipitally, wider than long and somewhat wider than the thorax; eyes rather small, in comparison with *Lelaps*, and broadly oval in shape; frontovertex very broad or nearly twice as wide as long; ocelli in an obtuse-angled triangle, the posterior pair about as distant from the eyes as their distance apart; cheeks about as long as two-thirds the width of the eyes; face with a shallow scrobal impression, which produces a slight emargination on the anterior margin of the frons in dorsal view of head; clypeus discrete and nearly twice as wide as long. Antennae inserted on the ocular line, thirteen-jointed; scape slender, cylindrical, moderately long, and reaching only a little beyond the scrobal impression; pedicel about equal to the first funicle joint; two moderately large ring-joints present; flagellum somewhat clavate, the funicle six-jointed, with the first joint about twice as long as thick (shorter in *coeruleus*), the sixth joint about as long as wide; club with three closely fused joints which decrease in length from basal to apical joint and form an oval mass nearly as long as the last two funicle joints combined. Labrum deeply bisinuate at apex so that there are three equal lobes, the middle lobe provided with two setae, the lateral lobes each with one seta; mandibles quadridentate; maxillary palpi long, four-jointed, the first and third joints subequal and shortest or about twice as long as thick, the second and fourth joints subequal, about as long as the first and third joints combined, the fourth joint being slightly fusiform; labial palpi three jointed, with the basal joint about thrice as long as thick, the middle joint very short and wider than long, and the apical joint slightly more than twice as long as thick.

Pronotum conically produced at apex and with a distinct collar at base which is considerably narrower than the mesoscutum; the latter with complete but extremely shallow parapsidal furrows which are not at all suture-like; lobes of mesoscutum slightly convex; scutellum somewhat shorter than the mesoscutum and provided with a distinct cross ridge at about one-fourth of the length from the apex; propodeum produced into a long neck, nearly as long medially as the scutellum and provided with a lateral carina on each side, which is not very distinct and extends from just inside the spiracle to the side of the apex of neck; spiracles minute and oval.

Abdomen about as long as the head and thorax combined; petiole about twice as long as wide, the next segment about one-fourth to one-third as long as the gaster, the following tergites not greatly unequal in length; gaster narrowly oval in shape, rather depressed above, triquetrously compressed beneath toward the base, the apex acute, with the ovipositor sheaths slightly protruded.

Wings moderately long and narrow, but distinctly shorter and wider than in *Lelaps;* marginal vein a little longer than the submarginal; postmarginal vein reaching nearly to the apex of the disk and about two-thirds as long as the marginal; stigmal vein moderately long, expanded into a small knob at apex; discal pubescence of wing sparse, in comparison with *Lelaps*, and rather long, the speculum absent; marginal fringe short.

Legs rather long, but somewhat shorter than in *Lelaps*; hind coxae very stout, tapering toward apex and about twice as long as thick; femora somewhat more swollen than in *Lelaps*; spur of middle tibiae very slender and about two-thirds as long as the basal joint of middle tarsi; spurs of hind tibiae well developed, the outer one somewhat the shorter; tarsi slender, the basal joint of the middle pair about equal to the three following joints combined.

Notum of thorax densely punctato-reticulately shagreened, with the separating lines considerably raised and mostly transverse, except on the scutellum; head much smoother, with the face and frons finely reticulate; propodeum, pleura, and mesosternum with fine, thimble-like punctures; abdomen smooth and polished. Pubescence of head and thorax very fine and soft; propodeum with a patch of white, appressed hair on each anterior corner, just exterior to the spiracles.

Male. Similar to the female; antenae slightly shorter with the flagellum much thicker, cylindrical and not clavate, the funicle joints about as wide as long or with the distal joints slightly wider than long; petiole of abdomen longer and slenderer or about four times as long as wide; gaster obovate, widest near apex and tapering toward the base; basal tergite of gaster about one-half as long as the whole gaster, the following tergites nearly equal; whole abdomen, including petiole, about four-fifths as long as the thorax, a little narrower and depressed.

Calolelaps basalis n. sp. Figure 6.

Female. Clypeal margin with a small median tooth and slightly emarginate on each side of the tooth. Antennae nearly as long as the thorax, the flagellum cylindrical and slightly clavate; first two funicle joints about twice as long as wide, the following joints gradually shortening, the sixth about as wide as long. Petiole distinctly narrowed at base, where it is inserted into a cavity at apex of the neck of propodeum; basal tergite of gaster covering about one-third of the surface of the gaster, the next two tergites about one-half as long as any of the four following tergites.

Face and frons finely reticulate and much smoother than the thorax, the vertex behind the ocelli and the upper part of occiput transversely and rugulosely shagreened; propodeum with deep thimble-like punctures, the mesopleura and mesosternum with similar, shallow punctures, those on the mesopleura becoming much finer in the shallow, obliquely longitudinal femoral furrow; prepectal plates with deeper, coarser punctures that are

considerably like those of propodeum; coxae with fine, almost imperceptible reticulations; petiole of abdomen finely and shallowly punctured.

Pubescence of head and thorax not very dense or prominent; eyes bare; patch of pubescence on anterior corners of propodeum white, woolly, and nearly concealing the underlying surface; abdomen very sparsely pubescent, except on the apical tergite, which is rather densely covered with pale yellowish, appressed hair.

Head and thorax bronzy violet, the upper part of the occiput slightly greenish, the pronotum except collar and mesosternum distinctly metallic green; petiole nearly concolorous with thorax, but brownish-yellow on sides and greenish dorsally at apex; first three segments of gaster or somewhat more than one-half the surface testaceous, with a small greenish-black, nubilous spot on each side near base of first tergite; three following segments of gaster blackish, with a greenish and golden luster that is not especially brilliant; apical segment of gaster yellowish, ovipositor sheaths black, the spicula brown. Scape yellow; pedicel and flagellum fuscous, but with the funicle joints partly somewhat yellowish, especially beneath; legs, including coxae, yellowish and excepting hind coxae somewhat paler than base of the gaster; apex of the last joint of the tarsi blackish. Wings hyaline; submarginal vein yellowish, and the remainder of the veins fuscous.

Length of body to apex of ovipositor sheaths, 3.48; length of head, 0.733; width of head, 0.917; least width of frontovertex, 0.537; length of antenna, 1.34; width of mesoscutum, 0.773; length of fore wing, 2.92; width of fore wing, 1.09 mm.

Male. Sculpture nearly as in the female, but the puncturation of the mesopleura uniform in size, and the petiole smoothish at apex above. Pubescence similar, but the latero-basal corners of the propodeum are less densely covered with whitish hair.

Dorsal half of head, the thorax and petiole moderately bright metallic green with a golden luster, with the head somewhat darker; latero-basal corners of propodeum, just in front of the spiracles, rosy purple; lower half of head, scape, legs and a little more than the basal half of gaster brownish-yellow, the first tergite of gaster having a nubilous, bluish-green quadrate mark at base which is somewhat wider than long and about one-half as long as the following yellow area; apex of gaster dark metallic green with a golden and purple luster; pedicel and flagellum of antennae blackish.

Length of body, 2.46; length of head, 0.544; width of head, 0.688; width of frontovertex at narrowest point, 0.419; length of antenna, 1.03; width of mesoscutum, 0.561; length of fore wing, 2.03; width of fore wing, 0.803 mm.

Described from one female (holotype) collected from *Eragrostis grandis*, Mount Kaala, Oahu, at about 2000 feet eleva-

tion, May 18, 1920 (Timberlake), and one male (allotype) collected in Palolo, Oahu, 2000 feet, in 1903 (Dr. Perkins).

The male may possibly belong to another closely allied species, but it seems to be too close to the female in its characters to be separated at present.

Calolelaps coeruleus n. sp.

Female. Clypeal margin slightly emarginate on each side of an extremely short median tooth. Antennae nearly as long as in *basalis*, but stouter and somewhat more clavate; scape, pedicel, and ring-joints similar to *basalis*; the funicle joints all about equal in length, increasing somewhat in thickness distad, the first and fifth as long as thick, the second, third and fourth slightly longer than wide, the sixth slightly wider than long; club as long as the two preceding joints combined. Petiole shorter than in *basalis* or about one-half longer than its apical width; gaster shaped about as in *basalis*, but more convex above; first tergite of gaster covering somewhat less than one-third the surface and equal to the two following tergites; second to seventh tergites of gaster all about equal in length; ovipositor sheaths slightly protruded.

Sculpture very similar to that of *basalis*, but all the coxae are distinctly and finely reticulate, the hind pair being much more coarsely reticulate above than elsewhere, and the front pair transversely lineolate, especially toward the base. Pubescence also similar, except that the latero-basal corners of the propodeum are provided with only a few short, whitish hairs.

Head and thorax bright metallic blue-green, the neck of the pronotum strongly bluish, the head somewhat more greenish with golden and reddish reflections, the latero-basal corners of propodeum with a bright rosy luster; abdomen bright blue-green, with the base of the tergites more bluish; ovipositor sheaths blackish-brown. Scape brownish-yellow, but becoming fuscous at apex, pedicel and flagellum blackish. Front and hind coxae bright metallic green on dorsal side, but blue-green beneath; middle coxae blue-green, although somewhat brownish on inner surface; remaining parts of the legs mostly brownish-yellow, with the hind tibiae somewhat brownish on dorsal margin and fuscous at apex, except beneath, and the last four joints of all the tarsi brownish above. Fore wings missing in the type, the hind wings hyaline.

Length of body to apex of ovipositor sheaths, 4.00; length of head, 0.749; width of head, 0.971; least width of frontovertex, 0.577; length of antenna, 1.28; width of mesoscutum, 0.881 mm.

Described from one female (holotype) found dead and in a somewhat mangled condition in a naeo tree (*Myoporum sandwicense* Gray) at Kealakekua, Kona, Hawaii, at about 3500 feet elevation on August 11, 1919 (Timberlake). If I remember

rightly this specimen had been caught in a spider's web. On account of the circumstances under which it was taken, both fore wings and one antenna are missing.

Stictolelaps new genus.

Closely allied to *Calolelaps* Timberlake and to *Neolelaps* Ashmead. In shape of the abdomen it is apparently much like the latter genus, but it differs in having the antennae shorter and more clavate and in having the stigmal vein very strongly knobbed at apex.

Genotype: *Stictolelaps flaviventris* n. sp.

Female. Similar to *Caloleps*, but with the following differences: Both mandibles tridentate; stigmal vein with a much larger, roundish knob at apex; petiole shorter or about as long as wide; gaster much narrower and longer than the thorax, strongly compressed, convex above and acuminate at apex; first tergite of gaster the largest and as long as the two following tergites combined, the apex of the third reaching just to the middle of the gaster; second to sixth tergites nearly equal in length, the seventh somewhat more than twice as long as the preceding tergite and very slender and spike-like; puncturation of notum more thimble-like, the face densely punctato-reticulate or almost with thimble-like punctures; propodeum with four foveae along the basal margin inside the lateral carinae.

Antennae inserted slightly above the ocular line and thirteen-jointed, there being two ring joints and six funicle joints; first two funicle joints a little longer than thick, the following joints about as wide as long; club about as long as the two preceding joints combined, ovate in shape after collapsing, somewhat wider than the funicle and with the first joint the longest and the apical joint the shortest. Palpi essentially as in *Calolelaps*, but having the apical joint of the maxillary pair about one-half longer than the second joint. Labrum trilobed at apex, the lateral lobes bare, the middle lobe provided with four setae, of which two are placed on the truncate apex and one on each side near the base.

Male. Similar to the female, except that the petiole is about four times as long as wide and the gaster strongly depressed, small, and narrowly oval. Antennae nearly as in the female, being short and slightly clavate, with the funicle joints as long as thick or the apical joints a little wider than long.

Two species known only in the male sex are included, however, which have the antennae considerably longer or with the funicle joints all longer than thick. These two species are *Stictomischus haleakalae* Ashmead and *Stictolelaps stigmatus* n. sp. The latter species also differs in having the mandibles quadri-

dentate. The discovery of the female of these species may necessitate their removal from *Stictolelaps*.

Stictolelaps flaviventris n. sp. Figure 7.

Female. Head and thorax with close, almost thimble-like punctures, changing to transverse, lineolate reticulations on the vertex behind ocelli and on the upper part of occiput; propleura with coarser punctures; puncturations at apex of scutellum beyond the transverse carina fully twice as coarse as on the basal part; propodeum with three short carinae separating the four basal foveae, the middle carina being continuous with some irregular and somewhat anastomozing rugae extending to apex of the propodeum; coxae, especially on the dorsal surface of the hind pair, very finely and delicately reticulate; abdomen smooth and polished. Pubescence of head and thorax fine, soft and pale yellowish, not especially abundant and quite inconspicuous; abdomen nearly bare except on the seventh tergite, which has numerous pale yellowish hairs similar to those of the thorax, but somewhat longer.

Head and thorax bright metallic green, the face and collar of pronotum with reddish and golden reflections, the other parts with a more or less golden luster; latero-basal corner of propodeum and contiguous margin of the mesopleura bright rosy purple; petiole metallic green; the gaster of abdomen yellowish-brown with a metallic greenish luster above at the base of the first tergite and on the sides near base of the fifth and sixth tergites; fourth tergite at base laterally, fifth tergite entirely, and the sixth, except basally above, darker brown or fuscous, seventh tergite purer yellow; ovipositor sheaths blackish, the spicula dark brown. Scape yellow, pedicel dark brown, flagellum blackish; legs, including coxae, brownish-yellow, the claws blackish; wings faintly smoky or almost hyaline, the veins fuscous.

Length of body to apex of ovipositor sheaths, 3.90; length of head, 0.646; width of head, 0.886; least width of frontovertex, 0.499; length of antenna, 1.15; width of mesoscutum, 0.763; length of fore wing, 2.48; width of fore wing, 0.940 mm.

Male. Very similar to the female in coloration and sculpture. Antennae similar, but slightly shorter and more clavate, the first funicle joint slightly longer than wide, the second as wide as long, and the four following joints a little wider than long. Petiole of abdomen about four times as long as wide, smoothish dorsally, and with fine thimble-like punctures on the sides; gaster small, narrowly oval, depressed, widest at the apical third and narrowing basad toward the petiole, and with the first tergite nearly as long as the following combined. Head, thorax, petiole, antennae, legs, and wings colored as in the female; basal segment of gaster brownish-yellow with a brilliant green, quadrate spot covering basal half of the tergum, the following yellow portion of dorsal aspect of first tergite about one-half wider than long; next three segments of gaster

dark purple, the remaining apical segments purple, but with a greenish and golden luster.

Length of body, 2.08; length of head, 0.539; width of head, 0.735; width of frontovertex, 0.436; length of antenna, 1.00; width of mesoscutum, 0.622; length of fore wing, 1.91; width of fore wing, 0.799 mm.

Described from one female (holotype) collected at Nuuanu Pali, Oahu, in 1904 (Dr. Perkins), and one male (allotype) collected on the Palolo Hill trail, Oahu, April 9, 1916 (Timberlake).

Stictolelaps haleakalae (Ashmead).

Stictomischus haleakalae Ashmead, 1901, Fauna Hawaiiensis, Vol. 1, p. 311, male.

This species is known to me only from the description, but it seems to be closely allied to the following species and easily distinguished therefrom by the largely aeneous-black legs.

Stictolelaps stigmatus n. sp. Figure 8.

Antennae inserted a little above the ocular line, rather elongate, not clavate; scape reaching to the plane of frontovertex; pedicel about twice as long as thick at apex; funicle joints all much longer than wide, decreasing gradually in length distad, the first about three times as long as thick and tapering toward the base, the sixth nearly twice as long as thick; club three-jointed and about as long as the two preceding joints combined. Mandibles quadridentate. Petiole of abdomen about thrice as long as wide and narrowest at base; gaster obovate, depressed and, together with the petiole, about four-fifths as long as the thorax; first tergite of the gaster covering about one-half of the surface, the following tergites about equal.

Head finely reticulate, but the vertex behind ocelli and upper part of occiput with fine, transverse wrinkles or rugae; collar of pronotum and the mesoscutum rather deeply and finely, reticulately punctured, with the separating lines mostly transverse; puncturation of scutellum more thimble-like, the apex of scutellum behind the transverse carina more coarsely reticulate, the lateral areas just behind the axillae smoothish, but with longitudinal rugulae; axillae finely reticulate; metanotum smooth and polished; propodeum within the lateral carinae finely and subrugosely sculptured and with an irregular median carina; meso and metapleura with fine thimble-like puncturation; propleura and prepectal plates coarsely reticulate; mesosternum reticulately punctured, and the coxae finely reticulate; petiole of abdomen with very shallow punctures or nearly smooth, the gaster smooth and polished. Pubescence blackish and rather abundant on the thorax, although not prominent; sides of propodeum nearly bare.

Upper part of head and most of occiput black, with a slight purplish luster on the frontovertex; face and cheeks bright metallic green; thorax

rather dark metallic green, but brighter on the pleura and propodeum, the mesoscutum and scutellum bluish-green, and the dorsal part of pronotum, except the posterior margin of the collar, purplish-black; metanotum with a brilliant golden and brassy luster; petiole of abdomen metallic green, the first tergite of gaster brownish-yellow with a small, bright blue-green spot at base close to apex of petiole, this spot being about one-fourth as long as the tergite; following tergites shining purplish-black, the venter shining yellowish and somewhat metallic; scape yellow, pedicel and flagellum black, the flagellum densely covered with semi-erect, short, brownish hair; coxae metallic green, the remainder of legs brownish-yellow, with the middle tarsi and claws of the other legs fuscous; wings faintly fuliginous, the cloud being a little darker in the area surrounding the stigmal vein; veins fuscous.

Length of body, 2.51; length of head, 0.577; width of head, 0.742; least width of frontovertex, 0.455; length of antenna, 1.46; width of mesoscutum, 0.622; length of fore wing, 2.16; width of fore wing, 0.898 mm.

Described from one male (holotype), Niu ridge, Oahu, February 10, 1918 (Timberlake).

EXPLANATION OF FIGURES PLATE IX.

Fig. 1. *Zaplatycerus fullawayi.*
A. Antenna of female. B. Antenna of male. C. Mandible of female in frontal view.

Fig. 2. *Chrysopophilus compressiventris.*
A. Antenna of female. B. Mandible in frontal view.

Fig. 3. *Chrysopophilus compressiventris.*
Hind leg of female.

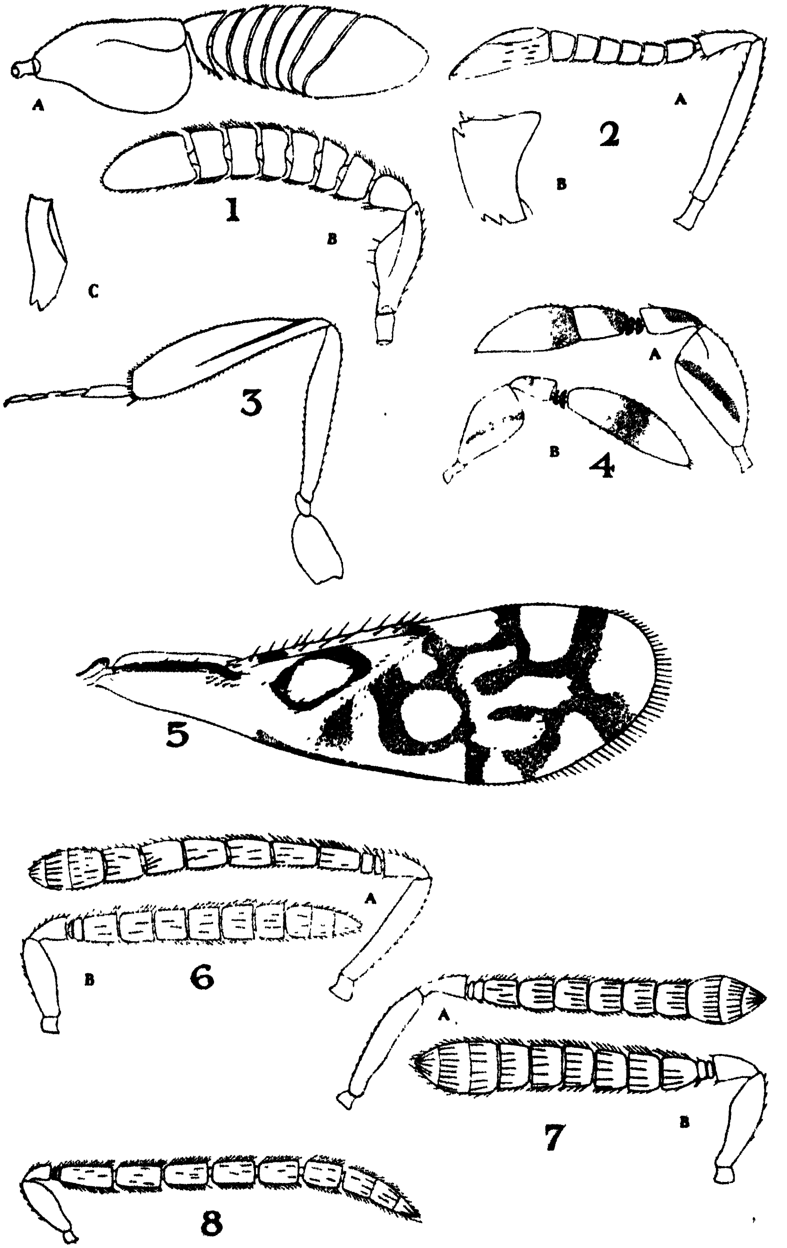
Fig. 4. *Marietta graminicola.*
A. Antenna of female. B. Antenna of male.

Fig. 5. *Marietta graminicola.*
Fore wing of female.

Fig. 6. *Calolelaps basalis.*
A. Antenna of female. B. Antenna of male.

Fig. 7. *Stictolelaps flaviventris.*
A. Antenna of female. B. Antenna of male.

Fig. 8. *Stictolelaps stigmatus.*
Antenna of male.



Central American and Hawaiian Chalcidoidea

PRESIDENTIAL ADDRESS.

The Insect Fauna of Trees and Plants as an Index of Their Endemicity and Relative Antiquity in the Hawaiian Islands.

BY O. H. SWEZEY.

(Presented at the meeting of December 4, 1924.)

In the study of the insect faunas of the different species of trees and plants of the Hawaiian Islands, a good deal of information has already been accumulated. Enough so that some significant considerations can be made, and one of these, it seems to the writer, is that the relative antiquity of the endemic trees may be indicated by a comparison of their respective insect faunas. In other words, the species of trees having the greatest number of endemic insects attached to them should be considered to have had a longer existence * in the Islands than have those trees with much fewer endemic insects attached to them. Furthermore, that trees with no native insects attached to them would be of most recent arrival, and possibly or probably not endemic.

When the writer began collecting and studying the native insects of Hawaii twenty years ago, it was found desirable to learn at once the names of the trees with which the various kinds of insects were associated. It soon became evident that certain kinds of trees support a much greater insect fauna than others. Thus it was learned which were the trees for good insect collecting, and which were the poor ones, or the ones on which it was useless to collect. The beginning of the faunistic studies of the respective trees was thus made, and, although considerable progress has been made, it is a field in which there is yet a vast amount to be done.

Proc. Haw. Ent. Soc., VI, No. 1, August, 1925.

* By this period of existence, I mean the time from when the tree first became established down to the present, and including all of the ancestral forms the tree may have passed through by evolution before reaching the present form to which we attach its specific name.

Among the common or better known trees, examples of those having a large number of native insects attached to them, are:

Acacia koa, Metrosideros collina polymorpha, Pipturus albidus, Pelea spp., and *Euphorbia* spp. Such trees and plants as *Straussia, Suttonia, Gouldia, Bobea, Coprosma, Freycinetia, Eugenia Sandwicensis, Cheirodendron, Cibotiuin* spp. *Astelia* and banana have a fair number of insects attached to them. Examples of those having only a small native insect fauna are *Santalum, Xylosma, Maba, Antidesma, Byronia, Wikstroemia, Perrottetia, Scaevola, Urera, Sapindus, Charpentiera, Xanthoxylon, Pritchardia, Hibiscus,* and *Hau.* Such trees as *Aleurites Moluccana, Eugenia Malaccensis, Callophyllum Inophyllum, Thespesia populnea, Cordyline terminalis,* and *Artocarpus incisa,* have no native insects attached to them. These latter are among the trees considered by some to have been brought to the Hawaiian Islands by the Hawaiian race in prehistoric times. The fact that during the time since then no species of insect has developed on these trees is quite significant when comparison is made with trees that are very evidently of greater duration in the Islands and have numerous kinds of insects attached to them. Of course, I am speaking from what is at present known. It may be that when greater biological knowledge is obtained, many more insects will be found associated with some of the trees on which at present few are known; for there is yet a great deal to be learned along these lines. All of the entomologists here are interested in the host relations of the native insects, and we are continually increasing our knowledge along these lines, and adding to what has already been published in the Fauna Hawaiiensis and the Proceedings of the Hawaiian Entomological Society.

Taking it from what we know at present, it is apparent that those trees which are attacked by the greatest number of species of insects, or that have the greatest number that are specially attached to them, must be those which have been in existence on the Islands for the greatest length of time, and thus have given the insects greater opportunity to become specialized and to develop the particular species which we now find attached to them. The *Acacia koa* may be taken as an example of such a tree.

Insect Fauna of Acacia Koa.

There are caterpillars of several species of moths of the endemic genus *Scotorythra* of the family *Selidosemidae* that feed on the foliage of the koa tree. One of them, *rara* (Butl.), is perhaps the most common, but it is not attached to the koa, as it feeds also on a large number of other trees, and to some extent on tree-ferns. Another species, *idolias* Meyr., of the same genus feeds on the koa also, often denuding the trees, but we are not yet sure whether its caterpillars similarly feed on other trees as well. There is a group of species, however, of the same genus which are particularly attached to the koa, and these species have developed on different islands: *caryopis* Meyr. on Oahu, *isospora* Meyr. on Kauai, *corticea* (Butl.) on Maui, *arucraca* Meyr. on Hawaii. It is possible that still some of the other species that are quite similar to these species may also be attached to koa, but at present their habits are not sufficiently known.

Another endemic genus of moths, *Aphthonetus*, has one or more species whose larvae feed on the phyllodes of koa. As there are twenty-nine species in the genus, and their habits are mostly unknown, it may be found that different species of this genus occurring on the different islands may, more of them, be attached to koa.

Several species of Tortricidae feed on the seeds of koa; in fact, they so completely destroy the seeds, that it is very difficult to obtain seeds for planting in reforesting projects. Most prominent of these are *Cryptophlebia illepida* (Butl.) and *C. vulpes* Walsm. A smaller species is *Adenoneura rufipennis* (Butl.), and in each of these genera one or more other species may have similar habits. Another tortricid, *Enarmonia walsinghami* (Butl.), feeds in dead twigs of koa, and also sometimes bores into the tips of living twigs. Larvae of an undescribed species of *Adenoneura* have been found abundant in and beneath the bark of recently felled koa. A good number of moths were reared, but await description. The larvae of one native butterfly, *Lycaena blackburni* (Tuely) feed on the blossoms and new foliage of koa.

There are four species and one variety of delphacid leaf-

hoppers attached to koa: *Ilburnia koae* (Kirk.), *I. rubescens* (Kirk.), *I. rubescens* var. *pulla* (Muir), *I. pseudorubescens* (Muir), *I. koae-phyllodii* (Muir). These species occur in different localities.

Of cerambycid beetles, there are quite a number belonging to three endemic genera. *Plagithmysus* has six species whose larvae feed in and beneath the bark and in the outer wood of dead branches or fallen koa trees. *Plagithmysus pulverulentus* (Motsch.) on Oahu; *arachnipes* Shp. and *aequalis* Shp. on Kauai; *finschi* Har. on Maui; *varians* Shp. and *blackburni* Shp. on Hawaii. *Callithmysus* has one species on koa: *cristatus* (Shp.) on Oahu. *Neoclytarlus* has ten species on koa; *fragilis* (Shp.) on Oahu; *obscurus* (Shp.), *longipes* (Shp.), and *annectens* (Shp.) on Kauai; *pennatus* (Shp.), *laticollis* (Shp.), and *modestus* (Shp.) on Maui; *debilis* (Shp.), *claviger* (Shp.) and *nodifer* (Shp.) on Hawaii. Besides these, two much larger cerambycids also feed in koa trees (*Parandra puncticeps* Shp. and *Aegosoma reflexum* Karsch), but they are not attached to koa, for they feed in other trees also.

The genus *Rhyncogonus* of the Curculionidae has two species (*blackburni* Shp. and *vittatus* Perk.) and possibly more which feed on the foliage of koa, though they may not be strictly attached to it.

Of the large genus *Proterhinus* of the family Proterhinidae, at least three species are attached to koa: *oscillans* Shp. and *vicinus* Perk. on Oahu; *validus* Shp. on Maui. Possibly a few others of the numerous species of this genus may also be found on koa.

A few species (undetermined) of Scolytidae attack koa; and a few species of Nitidulidae are attached to it.

A large bug (*Coleotichus blackburniae* White) feeds on the foliage oftentimes in large colonies, and a small bug (*Psallus sharpianus* var. *a* Kirk.) is more rare. One mealy bug (*Pseudococcus swezeyi* Ehrhorn) has been described from koa.

Taken altogether, there are forty or more species of native insects already known to be attached to *Acacia koa* (including its related species or varieties on the different Islands), and there are many others associated with it in one way or another. For so many species of insects to become developed and to have

acquired such particular habits as to feed only on one kind of tree must have taken a very long period of time, and can be taken to indicate that the existence of the koa in Hawaii is of great antiquity. It probably has more species of insects attached to it than has any other native Hawaiian tree, and therefore may be considered one of, if not the most, ancient of the trees comprising the present Hawaiian flora.

Insect Fauna of the Ohia Lehua.

The ohia lehua (*Metrosideros collina polymorpha*, and other species of the genus) is another tree much attacked by endemic insects. There are several caterpillars feeding on the foliage: *Eucymatoge monticolans* (Butl.) of the family Hydriomenidae; one or more species of *Scotorythra* of the family Selidosemidae; a tortricid, *Eccoptocera foetorivorans* (Butl.), feeds on the leaves; a carposinid, *Heterocrossa distincta* Walsm., feeds in the terminal buds; two tineids, *Philodoria splendida* Walsm. on Kauai and Oahu, *P. basalis* Walsm. on Maui and Hawaii, are leaf-miners.

Ten delphacid leaf-hoppers are known on lehua: *Leialoha naniicola* (Kirk.) on Oahu and Hawaii, *L. ohiae* (Kirk.) on Oahu, *L. lehuae* (Kirk.) on Oahu and Kauai, *L. lehuae kauaiensis* Muir on Kauai, *L. lehuae oahuensis* Muir on Oahu and Lanai, *L. lehuae lanaiensis* Muir on Lanai, *L. lehuae mauiensis* Muir on Maui, *L. lehuae hawaiiensis* Muir on Hawaii, *Nesodryas perkinsi* (Kirk.) on Oahu, and *N. gulicki* Muir on Hawaii.

One or more jassids are known, but the species are not determined.

Ten psyllids are attached to lehua: *Trioza iolani* Kirk. on Oahu and Kauai, *T. ohiacola* Crawf. on Oahu and Hawaii, *T. lanaiensis* Crawf. and *T. pullata* Crawf. on Lanai, *T. hawaiiensis* Crawf. on Hawaii, *T. kauaiensis* Crawf. and *T. lehua* Crawf. on Kauai, *Kuwayama gracilis* Crawf. on Oahu and Molokai, *K. nigricapita* Crawf. on Lanai and Hawaii, *K. minuta* Crawf. on Hawaii. Some of these form galls on the leaves, while others live freely on the surface of the leaves without galls.

A few species of Heteroptera are known, but undetermined.

Of the cerambycid beetles, three species of *Plagithmysus* are attached to lehua: *bilineatus* Shp. on Hawaii, *pulvillatus* (Karsch) on Maui, *aestivus* Shp. on Molokai. Of some of the other species of *Plagithmysus*, probably one on each of the other islands is attached to lehua, but it has not yet been ascertained. The large *Aegosoma reflexum* Karsch also is found in lehua, and it is likely that some others of the smaller beetles, such as Scolytidae, Proterhinidae, Nitidulidae, etc., will yet be found to be attached to this tree.

We have thus some thirty or more species of native insects which are attached to lehua, with probabilities of several more. Therefore, we consider that the lehua is another one of the trees which has for a very long period of time formed part of the Hawaiian flora.

Insect Fauna of Pipturus Albidus.

The mamake tree *(Pipturus albidus)* supports quite a large native insect fauna. The large spiny caterpillar of the Kamehameha butterfly (*Vanessa tameamea* Esch.) feeds on the foliage of this tree. It also feeds on *Neraudia, Urera, Touchardia* and *Boehmeria* to a slight extent (all closely related trees), but *Pipturus* is the chief host on all the Islands. Of other Lepidoptera, a leaf-roller, *Phlyctaenia stellata* (Butl.), feeds on the leaves; a twig-borer, *Epagoge infaustana* Walsm., bores the tips of growing shoots, and also feeds on the young leaves to some extent. Six tineid leaf-miners are already known, and other species may yet be discovered. Those known at present are: *Philodoria micropetala* Walsm. on Kauai, *P. pipturicola* Sw. on Oahu and Maui, *P. pipturiella* Sw. on Oahu, *P. floscula* Walsm. and *P. pipturiana* Sw. on Hawaii, *Gracilaria neraudicola* Sw. on Oahu and Hawaii. The latter was described from *Neraudia*, but was later reared more abundantly from *Pipturus*, which probably is its chief host plant.

Of Coleoptera attached to *Pipturus*, there are two cerambycids: *Plagithmysus lamarckianus* Shp. on Hawaii, and *Callithmysus koebelei* Perk. on Oahu. There are three bark-beetles: *Proterhinus pipturi* Perk. on Oahu, *P. vestitus* Shp. on Oahu, *P. blackburni* Shp. on all the Islands. The two latter species

occur on other trees also. A dead wood weevil, *Dryopthorus oahuensis* Perk., is attached to *Pipturus* on Oahu.

Of leaf bugs there are three or more, the known species being *Tichorhinus iolani* (Kirk.) on Oahu and Hawaii, *T. tantali* Perk. on Oahu, *T. kanakanus* (Kirk.) on Oahu, Lanai, Maui, and Hawaii. Two jassid leaf-hoppers are known: *Nesophyrosyne pipturi* Kirk. on Oahu and Maui, *N. ponapona* Kirk. on Oahu and Hawaii. Three delphacid leaf-hoppers occur on *Pipturus: Ilburnia pipturi* (Kirk.) on Oahu and Molokai, *I. mamake* Muir on Maui, *I. blackburni* (Muir) on Oahu, Maui, and Hawaii. The latter occurs on a number of other host plants as well.

One mealy bug, *Nesococcus pipturi* Ehrh., has been described from *Pipturus* on Oahu.

Altogether, there are twenty species of endemic insects attached to *Pipturus*, and the probabilities are that more will be added with further study.

Insect Fauna of Pelea spp.

The various species of *Pelea* in the Hawaiian Islands support quite a number of species of endemic insects. An interesting group of lepidopterous leaf-miners are: *Opostega maculata* Walsm., *O. serpentina* Sw., *O. callosa* Sw., *O. peleana* Sw., *O. filiforma* Sw., all on Oahu. Perhaps there are a few more, as mines differing from the mines of the above species have been discovered in various parts of the forests, some on the other Islands, but so far the adults have not been reared from these mines to determine the species.

Three species of psyllids have been described from *Pelea: Hevaheva perkinsi* Kirk. on Oahu, *H. silvestris* Kirk. on Oahu and Kauai, *H. minuta* Crawf. on Kauai.

Several species of jassids are known, but still undescribed.

The larva of a moth, *Prays fulvocanellus* Walsm., feeds in buds and seeds.

Four species of wood-borers of the genus *Plagithmysus* are known: *diana* Shp. on Kauai, *collaris* Shp. on Maui, *bishopi* Shp. and *vicinus* Shp. on Hawaii. Three bark-beetles are at-

tached to *Pelea*: *Proterhinus archaeus* Perk., *P. pusillus* Shp. and *P. pusillus* var. *subpusillus* Perk., all on Oahu.

Thus there are sixteen or more endemic insects known to be attached to the *Pelea* trees.

INSECT FAUNA OF EUPHORBIA SPP.

Euphorbia, with several species, has fifteen species already known preying on it and apparently attached to it. One cerambycid beetle, *Neoclytarlus euphorbiae* Brid. on Oahu. Five delphacid leaf-hoppers: *Dictyophorodelphax mirabilis* Sw. on Oahu, *D. swezeyi* Brid. on Oahu, *D. praedicta* Brid. on Maui, *Aloha kirkaldyi* Muir on Oahu, *Nesodryas gulicki* Muir on Oahu and Hawaii. One jassid, undetermined. Two plant bugs: *Psallus sharpianus* Kirk. on all Islands, *Ithamar* undescribed species on Oahu and Maui. Two phycitid moths, whose larvae feed on and web the leaves: *Genophantis iodora* Meyr. on all Islands, *G. leahi* Sw. on Oahu. Four bark beetles: *Proterhinus euphorbiae* Perk. on Oahu, *P. impressiscutus* Perk. on Oahu, *P. euops* Perk. on Oahu, *P. bridwelli* Perk. on Maui.

NATIVE TREES WITH SMALLER INSECT FAUNAS.

Of the trees having a smaller number of insects attached to them, so far as known at present, *Cheirodendron* has six species, *Eugenia sandwicensis* has five species, *Straussia* spp. have seven species, *Suttonia* spp. have six species, *Freycinetia Arnotti* has five species, *Cibotium* spp. have six species, *Sadleria cyatheoides* has four species, *Santalum Freycinetianum* has three species, *Xylosma Hawaiiense* has two species, *Hibiscus Arnottianus* has three species.

INSECT FAUNA OF CHEIRODENDRON SPP.

One bark beetle, *Proterhinus gigas* Perk. on Kauai. Four weevils of the genus *Nesotocus* on the different Islands: *kauaiensis* Perk. on Kauai, *giffardi* Perk. on Oahu, *newelli* Perk. on Maui, *munroi* Perk. on Hawaii. One moth whose larvae feed in dead stems: *Semnoprepia ferruginea* Sw. on Oahu.

Insect Fauna of Eugenia Sandwicensis—Ohia ha.

A bud-moth, *Heterocrossa distincta* Walsm., whose larvae feed in the terminal buds; a seed-moth, *Heterocrossa divaricata* Walsm., whose larvae feed in the fruit (they also feed in the fruits of Elaeocarpus); a bark-beetle, *Proterhinus blackburni* Shp.; two wood-borers, *Plagithmysus* concolor Shp. on Kauai and *P. solitarius* on Oahu; a leaf-hopper, *Nesodryas eugeniae* Kirk.; a jassid leaf-hopper, *Nesophrosyne* sp. A total of seven species.

Insect Fauna of Straussia spp.—Kopiko.

A leaf-miner, *Aristotelia* sp.; seven bark-beetles, *Proterhinus subangularis* Perk. on all Islands, except Kauai, *P. anthracias* Perk. and *P. maculifer* Perk. on Kauai, *P. archaeus* Perk., *P. obscuricolor* Perk., *P. subplanatus* Perk. and *P. angularis* Shp. on Oahu; one delphacid leaf-hopper, *Ilburnia pele* (Kirk.); one or more jassid leaf-hoppers, *Nesophrosyne* spp.; a mealy bug, *Pseudococcus straussiae* Ehrh. A total of eleven species or more.

Insect Fauna of Suttonia spp.—Kolea.

A seed-moth, *Heterocrossa nigronotata* Walsm.; two leaf-miners, *Philodoria succedanea* Walsm. and *P. auromagnifica* Walsm., a leaf-roller, *Archips* sp.; a delphacid leaf-hopper, *Leialoha suttoniae* Muir on Kauai; one or more jassid leaf-hoppers, *Nesophrosyne* spp.; two bark beetles, *Proterhinus myrsineus* Perk. and *P. maurus* Perk., both on Oahu. A total of eight species or more.

Insect Fauna of Freycinetia Arnotti—Ieie.

Crown-borer, *Catamempsis decipiens* Walsm., larvae numerous in crown of vine, on Oahu and Hawaii; stem-borer, *Euperissus cristatus* Butl., larva in dead stems, on Oahu, Molokai and Hawaii; two delphacid leaf-hoppers, *Nesodryas freycinetiae* Kirk. and *Ilburnia halia* Kirk., both on Oahu; a leaf bug, *Sulamita lunalilo* Kirk. on Hawaii. A total of five species.

Insect Fauna of Native Bananas.

A weevil, *Polytus mellerborgi* (Boh.), whose larvae feed in the base of the stem and corm; six or more leaf-rollers, *Omiodes blackburni* (Butl.) on all the Islands, *O. euryprora* Meyr., *O. meyricki* Sw. and *O. fullawayi* Sw. on Hawaii, *O. musicola* Sw. on Maui, *O. maia* Sw. on Oahu and Kauai; an undescribed species of *Omiodes* has been reared from banana on each of the Islands Maui and Kauai. A total of nine species.

Insect Fauna of Hibiscus Arnottianus.

A looper moth, *Cosmophila sabulifera* (Guen.), whose caterpillar feeds on the leaves; a leaf-miner, *Gracilaria hibiscella* Sw., on Oahu and Hawaii; a seed-moth, *Crocidosema marcidellum* (Walsm.), whose larvae infest the seed capsules, on Oahu; *Aleyrodes hibisci* Kot. A total of four species.

Insect Fauna of Paritium Tiliaceum—Hau.

Looper moth, *Cosmophila sabulifera* (Guen.): leaf-miner, *Gracilaria hauicola* Sw., *Aleyrodes hibisci* Kot. A total of three species.

Insect Fauna of Cibotium spp.—Hapu.

A delphacid leaf-hopper, *Nesorestias filicicola* Kirk., on Oahu; a jassid leaf-hopper, *Nesosteles* sp., on Kauai; six weevils in dead stems: *Heteramphus filicum* Perk. on Oahu, *Pentarthrum prolixum* Shp. on all Islands, *Proterhinus longulus* Shp. on Oahu, *Proterhinus blackburni* var. *hystrix* Shp. on Hawaii, *Oodemas aenescens* Boh. and *Pseudolus longulus* (Boh.) on all Islands. The two latter in dead wood of other trees also. A total of eight species.

Insect Fauna of Sadleria Cyatheoides—Amamau.

Three leaf-hoppers: *Ilburnia ipomoeicola* (Kirk.) on Kauai, Oahu and Hawaii, *I. amamau* Muir on Maui, *Nesorestias filicicola* Kirk. on Oahu; a drosophilid fly, whose larva bores in the stems of the fronds, on Oahu and Hawaii. A total of four species.

Insect Fauna of Santalum Freycinetianum.

Two looper caterpillars: *Scotorythra arboricolans* (Butl.) on Hawaii, *S. syngonopa* Meyr. on Kauai and Oahu; a leaf-roller, *Capua santalata* Sw. on Oahu; a mealy bug, *Pseudococcus gallicola* Ehrh. in galls on leaves on Oahu. A total of four species.

Insect Fauna of Xylosma Hawaiiense.

A tortricid moth, *Dipterina fulvosericea* Walsm., larvae feeding on the leaves, on Kauai, Oahu, Molokai and Lanai; a psyllid, *Cerotrioza bivittata* Crawf., on leaves without galls, on Oahu and Maui. A total of two species.

Insect Fauna of Coconut in Hawaii.

Leaf-roller, *Omiodes blackburni* (Butl.), abundant on all the Islands; two weevils: *Rhabdocnemis obscura* (Boisd.), the sugar-cane borer is occasionally in the base of the leaf stalks and the trunk, *Diocalandra taitensis* (Guen.), the Tahiti coconut weevil, a recent immigrant found on Hawaii and Oahu. A total of three species.

Enough of these tree faunas have been given to show what a variation there is in the number of insects that are attached to the various Hawaiian trees, the numbers in these given ranging from forty down to two. Probably every Hawaiian tree has one or more native insects attached to it. Now we find that the kukui tree (*Aleurites Moluccana*), which is quite recent, considered to have been brought by the Hawaiian race, has no endemic insect attached to it. Some insects are found on it more or less, but there are none of them specially attached to it. Apparently, it has not been here long enough for any such to develop on it yet. The kukui belongs to the group previously mentioned, including *Eugenia Malaccensis* or ohia ai, *Callophyllum Inophyllum* or kamani, *Thespesia populnea* or milu, *Cordyline terminalis* or ti and *Artocarpus incisa* the breadfruit. These have no native insects specialized on them.

The hau tree (*Paritium tiliaceum*) apparently has been here somewhat longer than these latter, for it has a Tineid leaf-miner (*Gracilaria hauicola* Sw.) attached to it, and occurring on all

the Islands. It has not been here long enough, however, for this leaf-miner to develop into different species on different Islands as have its allies, which are leaf-miners in *Pipturus*, *Metrosideros*, and some others. The native *Hibiscus*, too, has a related leaf-miner (*Gracilaria hibiscella* Sw.) which is the same species on all the Islands, so far as I have yet determined. The hau tree and hibiscus should be considered as of comparatively recent arrivals, the latter would be considered the older, however, for it has developed one more species than has the hau.

The coconut is another tree whose arrival has been somewhat recent. It may not be certain whether it was brought by the Hawaiians, or existed here already at the time of their arrival. Using its insect fauna to assist in solving this question, there is one native insect which seems to be attached to the coconut, the leaf-roller (*Omiodes blackburni*) which causes it to always have very ragged leaves. This leaf-roller also feeds to a slight extent on a few of the exotic palms that are planted. It also feeds considerably on the native palms (*Pritchardia* spp.) when they are planted on the lowlands, but I have only once found a few on any of these Pritchardias where I have visited them in their native habitat in the mountain forests. At one time I considered that this species of moth was attached to the native Pritchardias, and that it had adapted itself to the coconut after the latter arrived, but that was before I had seen the Pritchardias growing in their native habitat. Since the leaf-roller is not found generally feeding on the Pritchardias in the latter situations (and I have seen many such), I have abandoned the idea that *Pritchardia* is its native host. Apparently, this leaf-roller has not always been the pest on coconut that it is now, for Dr. Hillebrand makes this comment in his "Flora of the Hawaiian Islands," published in 1888, speaking of the coconut: "It thrives very well, as can be seen in the vigorous groves of Lahaina and Southern Hawaii. For a number of years, however, its leaves have been subject to the attacks of a moth which deposits its eggs in the folds of the leaf-segments." The coconut insects have received much attention in the various parts of the world where it is an important commercial plant, but in none of the publications on the subject is there any mention of the Hawaiian

coconut leaf-roller, which seems to me sufficient proof that the leaf-roller is not an introduced pest that appeared at the time Dr. Hillebrand mentions it. It is rather a native insect which fed naturally originally on some other plant and has taken to feeding on the coconut, on which it now feeds almost exclusively.

Here enters the wild banana and appears to have some connection; for this coconut leaf-roller has been found feeding on the leaves of the wild banana plant. The wild bananas in the Hawaiian Islands have six species of leaf-rollers of this same genus (*Omiodes*) feeding on them. The species are distributed as follows: *Blackburni* (the coconut leaf-roller) on all the Islands; *maia* on Kauai and Oahu; *musicola* on Maui; *meyricki*, *fullawayi*, and *euryprora* on Hawaii. None of these, except *blackburni* (the coconut leaf-roller), have yet been found feeding on any other plant than the banana. In the mountain gulches wherever clumps of wild banana plants are found, they are found to have one or more species of these leaf-rollers feeding on them, the species depending on the locality. I expect that more species will be discovered when banana clumps are examined in unexplored valleys.

We have thus six related endemic species of moths feeding on the wild banana, one species of which has taken to feeding on the coconut, while the other five species still remain with the banana. We have a parallel case in five other species of leaf-rollers of the same genus of moths, which are naturally grass-feeders, but one species of the five has taken to feeding on sugar-cane, and sometimes has been a very injurious pest where the canefields adjoin grassy regions. The other four species, however, of this group continue feeding only on grasses.

From the above consideration, I am convinced that the banana plant is of greater antiquity in the Hawaiian Islands than the coconut. Whether the banana was originally brought by the Hawaiian people or occurred here already before their arrival, perhaps needs further consideration. We do not know how long a time it takes for species to differentiate, but from the fact that we have these six species of leaf-rollers feeding on the wild banana and that some of the species occur on only one island, and that only one of the species is known to feed on anything else, five of them being strictly attached to the banana, is suffi-

cient indication that a great length of time is involved, possibly much longer than has elapsed since the coming of the Hawaiian people. On the other hand, if it were positively known that the banana did not exist here before the arrival of the Hawaiians, that they brought it, and if it was known how long ago that was, we would have some knowledge of the length of time involved in the formation of these six species of leaf-roller moths. Several of them are closely similar, indicating that they are not very old as species.

As compared with the *Acacia koa* and *Metrosideros,* the banana would be considered very much more recent when its insect fauna is taken into consideration. Enough examples have been given to illustrate the value of their insect faunas in considering the relative antiquity or the endemicity of trees or plants now occurring in the Hawaiian forests.

From this brief consideration of the subject, other questions are suggested. What was the food-plant of the ancestor of these banana leaf-rollers before the arrival of the banana, and have they all developed from one ancestor which first took to feeding on this plant? How does an insect change its habit so that it now feeds on an entirely different plant than did its ancestors? How do the species from a common ancestral form become so differentiated that each species feeds on a different plant, as is the case with many genera having numerous species in the Hawaiian fauna? What about the difficulty a new immigrant insect would have in becoming established in a place where its particular food-plant does not occur? The ancestors of our insect fauna must have succeeded in doing this, or else the flora of the Islands was entirely different at that time from the species of which it is at present composed.

Shall we consider the several species of any genus which have developed on separate plants, or at any rate are at the present time attached to different plants, as older than those species of a genus which have developed on the same plant, as where we have several closely similar species of a genus on the same plant? For example: The genus *Gracilaria,* the larvae of which are leaf-miners, of which *marginestrigata* is on *Sida* and *Xanthium, dubautiella* and *epibathra* on *Dubautia, mabaella* on *Maba, urerana* and *ureraella* on *Urera, hibiscella* on hibiscus,

hauicola on the hau tree, *neraudicola* on *Neraudia* and *Pipturus.* Should all of these species of the same genus, but on different food-plants, be considered older than the six species of *Omiodes* above mentioned as all occurring on banana? or the ten species of *Neoclytarlus* all occurring on koa? or the four species of *Ilburnia* on koa? or the eight Psyllids on lehua? Proper treatment of these and similar questions would require a lengthy consideration.

Aside from these considerations, it is of great importance that a study be made of the particular insect faunas of the important forest trees of the various groups of islands in the Pacific, that comparisons may be made, and use made of this information in assisting in the solving of the problems of plant migrations in Pacific regions. It is possible that thus, indirectly, there may be found somewhat of interest also in the problems of migrations of the Polynesian peoples in Pacific regions. As before intimated, the kukui tree (*Aleurites Moluccana*) for example, which is considered to have been brought to the Hawaiian Islands by the Hawaiian people when they came, has no endemic insect attached to it. Now, if the insect fauna of this tree was studied in all regions where it occurs, that region where the greatest number of insects preyed on it might be considered its natural home; then other regions where there was a less and less insect fauna on the tree could be taken more or less as successive stages in the spread of the tree, whether naturally or by the assistance of man, on account of the interest he may have had in this particular tree.

The entomologists here have already taken considerable interest in this matter of the peculiar insect faunas of the different trees of the native forests, and would be greatly interested in the outcome of similar work being done in other groups of Pacific Islands.

A Prothetelous Larva of Monocrepidius Exsul (Elateride, Coleoptera).

BY FRANCIS X. WILLIAMS.

The accompanying figure shows, enlarged four diameters, a larva of our most abundant elaterid beetle—a migrant many years ago from the Australian region—that has the wing-buds developed before the proper time, resulting thus in a larva with some pupal characters. This example was discovered May 12, 1922, by Mr. O. H. Swezey, among several larvae secured most probably from the island of Hawaii. It lived many weeks as a captive in a small metal box filled with soil, moulted twice as a prothetelous larva, and finally once more into a pupa which had shrivelled up and died before it was observed. During a

Larva of *Monocrepidius exsul.*

part of its life this abnormal individual was heavily infested with mites (acari) of which, however, it freed itself in a great measure in one of its ecdyses.

I append a small bibliography—undoubtedly incomplete—that refers to the subject of prothetely. The article by Hyslop (1916) is here of particular interest, since it treats of a prothetelous elaterid which shows the abnormal phenomenon of prothetely far more developed than in the *Monocrepidius exsul.*

Prothetely seems to be most common in coleopterous larvae.

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1903. Kolbe, H. J. Allgem. Zeitsch. fur Ent., VIII, pp. 1-9, 25-30 (larva of *Dendrolimus pini*).

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1911. Peyerimhoff, P. de, 1911. Bull. Soc. Ent., France, pp. 327-330 (larva of *Malthodes* sp.).

1912. Tragardth, I. Fauna och Flora, pp. 245-255.

1913. Muir, F. Proc. Haw. Ent. Soc., II, No. 5, pp. 219-220 (larva of *Lasiorhynchus barbicornis*).

1914. Barber, H. S. Psyche, XXI, pp. 190-192 (larva of *Lopheros fraternus*).

1914. Kemner, A. Ent. Tidsk (Swedish), XXV, pt. 1-2, pp. 87-95.

1914. Williams, F. X. Psyche, XXI, No. 4, pp. 126-129 (larva of *Photuris pennsylvanica*).

1916. Hyslop, J. A. Psyche, XXIII, No. 6, pp. 3-6 (larva of *Melanotus communis*).

Note on the Occurrence of Lyctus Villosus Lesne in the Hawaiian Islands (Coleoptera, Lyctidae).

BY HUGH SCOTT, M. A., SC. D., F. E. S.,
Museum of Zoology, Cambridge, England.

In "Fauna Hawaiiensis," Vol. III, Part 6, p. 644 (1910), the present writer recorded two species of *Lyctus* from the Hawaiian Islands. One was the very widespread *Lyctus brunneus* (Stephens); the other was a species then undetermined, two specimens of which were obtained by Dr. R. C. L. Perkins at Honolulu, XI. 1900. The latter species was entered as "*Lyctus* sp. ?," and one of the two specimens was eventually placed in the British Museum. In March, 1924, the writer went to Paris to work for some days in the Musée d'Histoire Naturelle. At the request of Monsieur P. Lesne, the unidentified *Lyctus* was borrowed from the British Museum and taken to Paris, where it was duly examined by Monsieur Lesne, who pronounced it to be *L. villosus*, a species described by himself (Bull. Mus. Paris, XVII, 1911, p. 537) from Mexico, and recorded (*l. c.*) as having been bred in numbers from a piece of the wood of "guaje," *Leucaena esculenta* Benth. (Leguminosae, Mimosoideae). The borrowed example of the insect has been returned to the British Museum, and the second Hawaiian specimen, which originally accompanied it, should be in the Bishop Museum at Honolulu.* It is thus established that *L. villosus* has occurred in the Islands.

Monsieur Lesne writes (in a letter, XI. 1924) that he has no additional records of this species, which is very rare in collections, and that it would be of interest to know if the insect is acclimatized in the archipelago. The following extract from a letter written by Dr. Perkins, 8. XI. 1924, gives details of how the specimens were taken: "I have no doubt that the *Lyctus* which you are writing about was caught in Honolulu itself, as I did a good deal of collecting in the winter of 1900 in that place when the weather was too bad for the mountains. I col-

* This specimen at the Bishop Museum has now been labelled *Lyctus villosus* Lesne, as above. [Ed.]

lected a lot of foreign beetles at that time under the bark of dead and dying trees in the town on empty lots. There were many such trees, as in an epidemic of plague some time previously part of the town was burnt out, and the loose bark on the burnt or partly burnt trees, which were still standing, harbored great quantities of introduced beetles and other insects. Most of these trees were leguminous, some belonging to the Mimosoideae and some not; I think I might say almost all were introduced Leguminosae."

Comments on Timberlake's Papers on "Introduced and Immigrant Chalcid-Flies of the Hawaiian Islands" and "Notes on Hawaiian Aphidae" Published in Proc. Haw. Ent. Soc. V, No. 3, 1924.

BY DR. R. C. L. PERKINS *

I recently received the issue of the "Proceedings" containing the above papers. I am particularly interested in these important papers. The following notes in regard to certain of the species will be of interest.

Page 420. One year, 1907 or 1908, *Brachymeria polynesialis* was very abundant in the garden of the house I occupied on Kewalo Street. The *Stomatoceras* was never seen in Honolulu up to and including part of 1897 (when I went back to England) but was conspicuous in 1900. (Many new insects appeared in 1900 which I had not seen up to 1897.)

Page 420. *Paranacryptus lacteipennis*. Terry took a specimen of this and I also got one outside Honolulu.

Page 426. *Chaetospila elegans*. I found this abundant in weevily rice or grain in Honolulu years ago.

Page 427. *Solindenia picticornis*. I am almost sure I have seen this from Fiji.

Page 430. *Homalotylus flaminius*. I fancy this species was not really from Honolulu, for Koebele put island labels on to a few things which he bred in Honolulu from outside material, generally when he liberated specimens or intended to, but *perhaps* sometimes when he had not this intention. I saw in his collection, I know, some Chalcids with a label, Koebele, Hawaii on them, which he told me were brought and bred there, and that he had liberated specimens. (N. B.) At one time Koebele labeled all Hawaiian insects "Hawaii" though many so labeled were from Oahu.

Page 432. *Adelencyrtus odonaspidis*. This was very abundant at any rate as early as 1904.

Proc. Haw. Ent. Soc., VI, No. 1, August, 1925.

* These comments by Dr. Perkins were in a letter dated Feb. 21, 1925. It is desirable that they be published as they supplement the remarks of Timberlake and furnish additional data in regard to certain of the parasites. [Ed.]

Page 441. *Melittobia hawaiiensis*. The proper date was 1904 early. The specimen was crawling up the window of the room I occupied at the Seaside Hotel, above the bathing rooms. I daresay the building is all changed now. I had then never seen a *Melittobia* and did not know the genus at all.

Page 445. *Oligosita hilaris*. This species was very abundant in grass on Bates street in 1904 in company with an apterous Aphelinine—*Marietta* I suppose, and I put many specimens of these in a small tube of alcohol, which so far I have been unable to find.

Page. 447. *Alaptus immaturus*. I should think this species was certainly introduced from Queensland for I am quite sure I liberated specimens. There were no other insects except *Psocus* and cane leafhopper in the Queensland cages and I knew it was breeding on one or other of these. I never felt at all sure that it was a parasite of leafhoppers. Also before this, Terry had taken stuff sent by us from Queensland out to Oahu plantation by Koebele's direction.

Page 450. When I first came to the Islands all the *Pelea* trees in the higher mountains (e. g. round Kilauea) were covered with and seriously injured by an Aphis. To the naked eye the appearance was that of *Myzus citricidus*. Later these trees became all quite, or practically, clean, and I do not remember seeing Aphis on the *Pelea* in later years. At first (i. e. before they disappeared) the trees were swarming with Koebele's introduced ladybirds. I sent this Aphid to England in alcohol, but I expect the tube dried up and the contents were thrown away. At the time I refer to, the *Olla abdominalis* (Say) were all through the forest, fairly plentiful, but not excessively numerous and there were no other of the larger ladybirds.

Records of Immigrant Insects for 1924.

BY THE EDITOR.

The following immigrant insects in Hawaii are recorded for the first time in this issue of the Proceedings. Those marked with an asterisk were observed for the first time in 1924.

The two last, although observed for the first time in 1924, were recorded on pages 450 and 455, respectively, of the Proceedings of the Hawaiian Entomological Society for 1923. Published December, 1924.

PROCEEDINGS

OF THE

Hawaiian Entomological Society

Vol. VI, No. 2. For the Year 1925. July, 1926

JANUARY 8, 1925.

The 229th meeting of the Hawaiian Entomological Society was held at the Hawaiian Sugar Planters' Association Experiment Station at the usual hour.

President Williams presided. Other members present were Messrs. Rosa, Swezey, Muir, Illingworth, Willard, Lutken, Van Zwaluwenburg, Bryan, Fullaway, Pemberton, and Ehrhorn.

The minutes of the last meeting were read and approved.

The Executive Committee reported that it had approved the bill for printing 1923 Proceedings, and that the bill had been paid by the trustees of the Hawaiian Sugar Planters' Association. Mr. Swezey moved that a vote of thanks be given to the Association for this assistance, and a copy of the Proceedings be sent to the members of the board of trustees. Carried. The following appointments were also reported: Custodian, Dr. F. X. Williams; Librarian, Joseph Rosa; Editor, O. H. Swezey.

PAPER.

"Observations on Chrysomyia Megacephala Fabr., Our Common Blow-Fly, in the Orient."

BY J. F. ILLINGWORTH.

NOTES AND EXHIBITIONS.

Monomorium fossulatum seychellense Emery.—Mr. Swezey exhibited queens and workers of this ant from a small colony that he had found among cane roots at Grove Farm Plantation, Kauai, April 21, 1922. This ant was first recorded by Mr. Tim-

berlake at the March, 1924, meeting of the Society, when he reported its having been determined by Doctor Wheeler. It was then recorded from Honolulu, Makiki and Puuloa, Oahu, and Honokaa, Hawaii. This Kauai record extends the distribution of this ant in the Islands. Recently Mr. Van Zwaluwenburg has found it in soil of cane-fields at Waipio, Kahuku and Puuloa, Oahu, which indicates that it has a very general distribution here.

Nesocrabro stygius (Blkb. and Cam.).—Mr. Swezey exhibited two males of this wasp which issued from cocoons that he found in an excavation in a piece of rotten wood of *Elaeocarpus* tree lying on the trail at about 1500 feet elevation in the forest above Kahuku, Oahu, November 23, 1924. The wasps issued December 8 and 11. Similar nesting habits for this wasp were recorded by Mr. Bridwell in 1916, he having found a nest provisioned with *Discritomyia* flies, which seems to be what were used in the present case, from the fragments remaining. Doctor Perkins has recorded this wasp as preying on these flies.

Syrphus opinator O. S.—Mr. Swezey exhibited a specimen of this syrphid fly which emerged December 31, 1924, from a puparium found in celery imported from California. This illustrates one way that an occasional immigrant insect may arrive. In this case a beneficial insect, if enough of them could arrive and become established, as it is a predator on plant lice.

Trigoniulus lumbricinus (Gerst.).—Mr. Swezey reported the recent determination of this large brown millipede by R. V. Chamberlain of the Museum of Comparative Zoology, Cambridge, Mass. Kirkaldy first recorded this Myriapod in December, 1906, as a recent immigrant. A number of years after that date it was occasionally found among cane trash at the Experiment Station, Hawaiian Sugar Planters' Association. The past three or four years it has been found more abundant, and at present is in countless thousands feeding in a compost heap composed of decaying sugar-cane leaves that have been heaped up for composting. The disintegration of the mass is greatly hastened by the feeding of these numerous millipedes. Mr. Chamberlain wrote of this millipede that it was probably East Indian in origin, but now widely distributed on tropical islands and in tropical countries and has reached the West Indies.

Orphnaeus brevilabiatus (Newp.).—This is a centipede which was also determined by Mr. Chamberlain at the same time as the above. It is a very slender one about three inches long when fully extended. Mr. Swezey found two specimens in an old mud-dauber wasp nest on the under surface of an overhanging rock in Waimalu Valley, Oahu, March 2, 1924. Mr. Chamberlain wrote that this was a tropicopolitan form, and that he had seen several other specimens from Hawaii. He did not state whether previously recorded from Hawaii. Perhaps this is the first record.

Odynerus oahuensis D. T.—Doctor Williams exhibited specimens of *Odynerus oahuensis* reared in December 26 (♂), December 31 (♀), 1924, from nests collected at Waikane, Oahu, December 14, 1924, and read notes on the habits of this wasp, which builds mud cells instead of utilizing holes in soil or rock as other native species of *Odynerus* do.

Fiji Topography and Flora.—Mr. Bryan exhibited a large series of photographs illustrating Fiji topography and flora. They were taken by him during his exploration trip there in 1924.

Coptotermes intrudens Oshima.—Mr. Swezey reported finding specimens of this termite in a telephone pole a mile up in Palolo Valley.

Plague Flea.—Mr. Pemberton exhibited specimen of the plague flea (*Xenopsylla cheopis* Roths.) and gave notes on its occurrence in Hawaii. He stated also that the common flea on dogs here is the cat flea (*Ctenocephalus felis* (Bouche)), and that the dog flea has not been found in Hawaii.

FEBRUARY 5, 1925.

The 230th regular meeting of the Hawaiian Entomological Society was convened at the usual place at 2:30 p. m., President Williams in the chair. Other members present: Messrs. Bryan, Crawford, Ehrhorn, Giffard, Illingworth, Lutken, Muir, Pemberton, Rosa, Swezey, Van Zwaluwenburg, and Willard. Prof. J. H. Comstock and Anna Botsford Comstock were visitors.

The minutes of the January meeting were read and approved.

Mr. Giffard read a radiogram to the Bishop Trust Company of Honolulu, notifying them of the death of Mr. Albert Koebele, an honorary member of this society.

Upon motion of Mr. Giffard, it was voted that the president appoint a committee to write an obituary, and to formulate a resolution expressing the regrets of the society occasioned by the loss of such an esteemed member; both of which to be read at our next meeting.

On invitation of the president, Professor and Mrs. Comstock made a few remarks.

Professor Comstock expressed surprise at finding such a strong organization of entomologists in Hawaii. He stated that, although he had taught many economic entomologists, he felt like a novice in economic entomology here, where so much had been, and is being, accomplished along that line. His account of the development of the Department of Entomology at Cornell University was of particular interest. When he entered Cornell in 1871, there was no course in entomology there, although interest in the subject was beginning to be manifest. During his sophomore year, 1872, he was called upon to deliver a course of lectures in Entomology, while during his junior year he was made Instructor in Entomology. Dr. David Starr Jordan, for many years president of Stanford University, and Dr. L. O. Howard, chief of the Bureau of Entomology, United States Department of Agriculture, were both students of his during these first two years. Many of the prominent entomologists of today received their early training under Professor Comstock at Cornell. From the modest beginning of a course of lectures given by one instructor in 1872, the Department of Entomology steadily grew under the direction of Doctor Comstock, until some ten years ago, when he relinquished active charge of the department, it required thirty professors and instructors to care for the students desiring instruction in Entomology.

Mrs. Comstock gave an interesting account of her work in Entomology, stating that she began her work by assisting her husband in making pictures of microscopic insects. Later she learned wood-engraving, to assist him in publishing his "Manual

for the Study of Insects." She said that she had been working in Nature Study for the past thirty years, and related considerable of her experiences therewith.

PAPERS.

"The Genus Popillia, with Its Natural Enemies in the Orient."

BY J. F. ILLINGWORTH.

"The Common Muscoid Flies Occurring About Sweet-Shops in Yokohama, Japan."

BY J. F. ILLINGWORTH.

"Distressing Itch from a Moth, Euproctis flava Bremer, in the Orient."

BY J. F. ILLINGWORTH.

NOTES AND EXHIBITIONS.

Lysiphlebus testaceipes Cress. Mr. Swezey reported finding this braconid established in a corn-field at the United States Agricultural Experiment Station January 24, 1925, where there was considerable infestation by *Aphis maidis* Fitch. The parasite was introduced from Whittier, California, in February, 1923. Mr. Timberlake found aphids highly parasitized by it there at that time and sent a quantity of material to Honolulu, from which nearly 4000 parasites issued for liberation. These were liberated about Honolulu in many places where infestations by various aphids were found. This is the first record of its recovery. On February 4, a few cane aphis were found parasitized by it at the Experiment Station, Hawaiian Sugar Planters' Association, where the aphis was very scarce.

Parasite of Gray Sugar-Cane Mealybug.—Mr. Swezey reported rearing a new parasite from *Pseudococcus calceolariae*, collected January 17 on sugar-cane at the Manoa substation. Fourteen of them had already issued from a few of the mealybugs brought in. This is the first recovery of this undetermined mealybug parasite, which was introduced from Mexico in 1922.

Three specimens were found in the collection, labeled as reared by Osborn from *P. calceolariae*, July, 1922, at El Potrero, Vera Cruz, Mexico. Several mealybug parasifes were being sent from Mexico at that time, and this must have been among them, but no definite records of it were found.*

Bruchus Near Coryphae Oliv.—Mr. Swezey reported finding seeds of *Ipomoea pes-caprae* infested by this beetle on the beach east of Waimanalo, February 1, 1925. This extends its known distribution from Barber's Point around the south coast to Waimanalo.

Desmometopa m-nigrum (Zett.).—Mr. Illingworth bred this agromyzid fly in abundance from mascerated hen manure in March, 1916. (See Proc. Haw. Ent. Soc., Vol. V, p. 270.) Specimens were sent at that time to the United States National Museum for identification, and recently Doctor Aldrich of that institution has identified it as above.

Lispa metatarsalis Thoms.—On May 20, 1916, Mr. Illingworth captured a specimen of this anthomyid fly and sent it to the United States National Museum for determination. Doctor Aldrich has recently determined it as above. Apparently the specimen sent became broken, for Doctor Aldrich returned the pin containing the data, and also a specimen collected by W. H. Ashmead, having the following data: "Kilauea, Hawaii, 4000 feet altitude, 21.7." This is the only known specimen now in Hawaiian collections, though the species was described from Honolulu by Thomson in 1858.

Pulsation of Dorsal Vessel of Wasp Larvae.—Mr. Williams stated that the pulsation of the dorsal vessel of wasp larvae may be slower or faster, according to the physiological condition of the larva. It is slow when hibernating and quite fast when the larva is approaching pupation. In the rolled up and more wrinkled larvae, there are from five to nine beats per minute; while in the distended and unrolled larvae near pupation there are from thirty to thirty-two beats. He observed also that the

* Specimens were sent to Mr. Timberlake, who determined them as *Thysanus dactylopii* (Ashm.), and expressed the opinion that it was a secondary parasite.

heart beats of a tiger beetle larva, which had been paralyzed by a Brazilian Pterombus wasp, were 12.5 per minute; while the pulsations of the normal beetle larva were about thirty per minute. He noticed that after several minutes of beats there would be a pause or rest in the pulsations. A similar pause had been noticed in 1924 by Gerould in a chrysalis of the butterfly *Colias eurytheme*.

Koenenia sp., belonging to the Palpigrada (Arachnida), was reported by Mr. Van Zwaluwenburg as first being recorded at the December, 1924, meeting as occurring in soil in Honolulu; but since it has later been found in soil samples from points as far apart as Honolulu, Waianae, and Kahuku, it is probably generally distributed on Oahu.

MARCH 5, 1925.

The 231st meeting of the Hawaiian Entomological Society was convened at 2:30 p. m. at the Experiment Station of the Hawaiian Sugar Planters' Association, President Williams presiding. Other members present were Messrs. Bryan, Crawford, Ehrhorn, Illingworth, Lutken, Muir, Giffard, Rosa, Swezey, and Willard. Prof. and Mrs. J. H. Comstock, R. W. Paine, and T. H. C. Taylor were visitors.

The minutes of the 230th meeting were read and approved.

A committee consisting of Mr. O. H. Swezey, Mr. W. M. Giffard, and Mr. F. Muir reported on the obituary of the late Mr. Albert Koebele.

NOTES AND EXHIBITIONS.

Danaus archippus Fabr.—This milkweed butterfly was recorded by Doctor Illingworth as a serious pest of an introduced shrub, *Calotropis gigantea* R. Br., which belongs to the milkweed family. This shrub is an introduction from India. The flowers are commonly used by the native Hawaiians for making leis. A large specimen of this plant in the Bishop Museum yard, has been almost entirely defoliated by the caterpillars during the past month.

Ptychomia remota Aldrich.—Mr. Bryan exhibited paratype specimens of this tachinid fly, which is a parasite of the xygaenid moth, *Artona catoxantha* Hamps., in the Federated Malay States. The moth is a serious enemy of coconut trees and is related to *Levuana iridescens* B.-B., the bad coconut pest of Fiji. The flies were bred by B. A. R. Gater, Kuala, Lumpur. The specimens were sent to the Bishop Museum by Doctor Aldrich, whose description is published in the Proc. Ent. Soc., Washington, Vol. 27, p. 13, January, 1925.

Xiphidiopsis lita Hebard.—A living female of this phasgonurid was exhibited by Mr. Swezey, with remarks on its habits. He had found that she ate corn aphis very voraciously, in confinement. When given 13 inch-long *Spodoptera* caterpillars, she had eaten them in two days. Apparently this is a beneficial insect. Further experiments will be made on its food habits.

Allograpta obliqua Say.—Mr. Swezey reported that four specimens of this syrphid fly had issued from a mass of leaves of Poinsettia infested with the mealybug *Pseudococcus virgatus*, which Q. C. Chock, Mr. Fullaway's assistant, was using in breeding lady beetles. This is an aphis-feeding species, but apparently it will feed on mealybugs also.

**Archytas* sp.—Mr. Swezey exhibited a specimen of this Mexican tachinid fly, caught by him on Hilo grass along the Manoa Cliffs trail on Mount Tantalus, February 23, 1925. This fly was reared by Mr. Osborn from armyworms collected in sugarcane at Los Mochis, Sinaloa, Mexico, in January and February, 1924. A batch of pupae of *Cirphis latiuscula* Herr.-Sch. were sent to the Experiment Station. They were received February 12. From these, fifteen tachinids of three species issued, 1, 3, and 11 of each, respectively, from February 12 to 26, mostly February 20 to 24. Nine of these flies were liberated February 25 at the United States Experiment Station in a citrus orchard where there were armyworms on nutgrass. Doctor Williams observed one or more of the flies in another part of the station grounds about February 20, 1925, which was the

* Specimens have been named *Archytas cirphisae* n. sp. by Mr. C. H. Curran, but no published description has yet come to our notice.—Editor.

first intimation that they had become established. The present capture at so distant a place would indicate that it is well established.

Cylene crinicornis Chevr.—Mr. Swezey exhibited a specimen of this longicorn beetle reared from a log of *Poinciana regia* wood, and reported having reared it similarly from *Albizzia lebbek*. This is the beetle known as the kiawe beetle on account of its habit of breeding so commonly in felled kiawe trees. These records indicate that it is not restricted to kiawe as a host.

Lycaena blackburni Tuely.—A specimen of this native Hawaiian butterfly was exhibited by Mr. Swezey, which had been found by him at rest on a ladder on a Japanese naval boat berthed at Pier 9, Honolulu harbor, February 28, 1925. It is the first time the species has been taken by him at sea-level, as it usually remains in the mountain forests. A specimen of it was also taken in February, 1925, in the citrus orchard of the United States Experiment Station.

Mrs. Comstock gave a very entertaining talk on her observations of entomologists, which was followed by a talk by Professor Comstock, in which he gave some very interesting reminiscences of his early experiences in Entomology.

APRIL 2, 1925.

The 232nd meeting of the Hawaiian Entomological Society was held at the usual place at 2:30 p. m., President Williams in the chair. Other members present: Messrs. Bryan, Crawford, Ehrhorn, Giffard, Lutken, Muir, Swezey, Rosa, Illingworth, Van Zwaluwenburg, and Willard. D. LeRoy Topping was a visitor.

The minutes of the 231st meeting were read and approved.

The acting secretary reported that $30 had been voluntarily subscribed by members of the society, and sent to the Zoological Society of London to assist in the publication of the Zoological Record.

PAPERS.

* "Oestrus ovis and Ocular Myiasis."

BY D. L. CRAWFORD.

"Notes on Sarcophaga fuscicauda Böttcher (Diptera)."

BY J. F. ILLINGWORTH.

"Notes on Chrysomyia megacephala Fabr. (Diptera)."

BY J. F. ILLINGWORTH.

NOTES AND EXHIBITIONS.

Xylocopa varipuncta Patton.—Mr. Williams noted that this insect, feeding on Convolvulus flowers in Honolulu, evidently knew that it could not force its bulk far into the corolla, paused but a moment, if at all, at the wide bell, then flew over the top of the flower and drew the nectar through a slit made at the base of the corolla. In Campinas, Brazil, he noted certain metallic bees feeding at other tubular flowers, probably Bignoniaciae, in the same manner, attacking them at the base immediately, where there were one or more slits. A few other bees, among them a large species probably parasitic, entered the tubular corolla, but with what success he did not know.

Chiromyia (Scyphella) flava (Linn.). — Mr. Bryan exhibited two specimens of this yellow geomyzid fly, with the following note on its occurrence in Hawaii. In 1918 Mr. Giffard included this species in a list of "Samoan insects which also occur in Hawaii." (Proc. Haw. Ent. Soc., IV, p. 181.) A specimen was secured from Doctor Aldrich to compare with local material, and so far one specimen has been found, labeled Barber's Point, 12-23-23, O. H. Swezey. It happens, however, that the specimens from Samoa do not belong to this species, but are an undetermined species of Anthomyidae, which also occurs in Hawaii. This would indicate that *C. flava* is present in Hawaii, but not in Samoa. Concerning the specimen from the United States National Museum, Doctor Aldrich says: "*Chiromyia flava*

* Not available for publication.—Editor.

occurs only on windows, especially in damp places, such as basements. I obtained quite a series, including the one I am sending you, on laboratory windows at Friday Harbor, Washington, the building standing on piles over the edge of the ocean." Malloch gives a key to this and related species, Proc. Ent. Soc., Washington, V. 16, pp. 179-181, 1914. The species also occurs in Europe.

Gynandromorph Ant.—Mr. Swezey exhibited a specimen of ant found by him in a nest in the remains of a compost heap at the Experiment Station, Hawaiian Sugar Planters' Association, March 20, 1925. The left antenna of this specimen was that of a male, while the right antenna was that of a female. The species was apparently *Cardiocondyla nuda minutior* Forel.

Celerio perkinsi Sw. — A fine specimen of this rare native sphingid moth was exhibited by Mr. Swezey. He had reared it from a small caterpillar he had found on *Kadua* on Malamalama ridge, Oahu, February 8, 1925.

In rearing the caterpillar, it was fed mostly on leaves of *Straussia*, as they were more readily obtainable. The caterpillar pupated March 6, and the adult moth emerged March 30. The caterpillar stage was over a month, and the pupal stage twenty-four days.

Xyphidiopsis lita Heb. — Reporting on further experiments with this phasgonurid, Mr. Swezey stated that it ate tineid moths, *Gracilaria marginestrigata* Walsm., sixteen of them in twenty-four hours. It did not eat *Pseudococcus sacchari* much, but did eat extensively of *Cerataphis* when supplied. When fed with flowers of several kinds, it ate hibiscus corolla and stamens to a slight extent, and the corolla of *Bignonia venusta* slightly; but geranium flowers not at all. These observations seem to indicate that the insect is chiefly insectivorous. Two weeks before it died, twenty-seven eggs were laid loosely in the cotton plug closing the mouth of jar in which confined. The egg is flattish cylindrical, slightly over 2 mm. long, ends rounded and with a groove extending a short distance down one side, that from one end a little longer than the other; white, surface minutely roughened with very fine mosaic structure, as shown under microscope.

Meliphora grisella Fabr.—Two specimens of this bee moth were exhibited by Mr. Swezey, which he had reared from larvae found feeding on honeycomb in the cavity of a stump in a valley along the Firebreak Trail at the base of Mount Kaala, October 26, 1924. This had been a "bee tree" which had been robbed by someone previously. Some moths were about the fragments of comb left. A few of the larvae were found, and a piece of comb taken along for them to feed on. They seemed to require considerable time to mature, for the moths did not issue until March 24 and 30, respectively, five months after their capture.

Anastatus koebelei Ashm.—Mr. Swezey exhibited two specimens of this eupelmine reared respectively from eggs of *Celerio calida* Butl. and *Elimaea punctifera* Walk. The egg of *calida* was found on a leaf of *Scaevola chamissoniana* on a ridge in Manoa Valley, March 15, 1925. The parasite issued March 29. The egg of *Elimaea* was in a coconut leaf, and the parasite had issued on March 23. The parasite had been reared from the latter host a number of times, but it is thought that this is the first record of it from a sphingid egg.

Chrysopa lanata Banks.—Mr. Swezey reported having recently received this determination by Nathan Banks for this immigrant chrysopid, that has been known in the Islands since its first discovery by Mr. Timberlake, being reported by him at the November meeting, 1919. Mr. Banks gives its distribution as Peru, Chile, Argentina, and South Brazil. It was described by him from Argentina in 1910.

Engytatus geniculatus Reuter. — Mr. Swezey reported having obtained this name, determined by E. P. Van Duzee, for the small mirid bug which was discovered on tomato plants in August, 1924. Mr. Van Duzee stated that it occurred "from Florida to Texas and through Arizona to Southern California. Also in Sonora and Lower California." He had not taken it often, and had no records of its food plants. Apparently it is not to be feared as a new pest here. A few could always be found on tomato vines ever since their first discovery in August, but they have not been found on anything else yet.

Lepisma cincta Oudemans. — A very large silverfish was exhibited by Mr. Swezey. It was found by Mrs. Madden in

a box of carbon-paper sheets. It is larger than the common silverfish, more hairy, and of a darker slaty color with a white posterior band on the prothorax. Apparently the first time that the species has been noticed in Honolulu. It resembles a picture of *Lepisma cincta* in the Cambridge Natural History. It may turn out to be that species, described in 1890 from Java by Oudemans.

Insects on Board Ship at Sea.—Mr. Illingworth exhibited the following seven species of insects, captured on board the S.S. President Lincoln, during his voyage from Shanghai, September, 1924.

1. Blow-fly, *Chrysomyia megacephala* (Fabr.).
2. Grasshopper, *Atractomorpha ambigua* Bolivar.
3. American cockroach, *Periplaneta americana* (Linn.).
4. German cockroach, *Blatella germanica* (Linn.).
5. Cattle-fly, *Musca convexifrons* Thoms.
6. Preying mantid, undetermined.
7. Male moth, undetermined.

Mr. Illingworth stated that this is a vivid illustration of how such winged pests are constantly coming to us by the ships of commerce. Even the most stringent and efficient quarantine system availing little against such foes. They easily fly over the heads of boarding officers and land at any port of call. It will be noted, he said, that the first four species are already well established in Hawaii. Attention was called to the fact that the type locality for the grasshopper is Shanghai. Mr. Illingworth found it widely distributed in the Pacific, it being abundant in China, Japan, Australia, etc. He pointed out, further, that the fifth species is a very troublesome fly around stock, both in Queensland and the Orient. Though not a bloodsucker, it is particularly anoying to both man and beast, by its persistent attempt to get at the mucous membranes, especially around the eyes, nose, and mouth. Experimenting with this fly in Queensland, Mr. Illingworth found that it is a viviparous species, breeding normally in cow-dung.

Insects Taken in Quarantine.—Mr. Ehrhorn exhibited a parasite, reared from *Aspidiotus* sp. on ginger from the Philippines

found in baggage. He exhibited, also, some Hymenoptera * reared from galls on bamboo, used as brooms, from Japan. These brooms were dipped in corrosive sublimate for fungi, and fumigated with carbon bisulphide for insects.

Archytas sp.—Mr. Rosa exhibited several specimens of this tachinid fly, which was recently introduced from Mexico as a cutworm parasite. He stated that he had observed them in large numbers on milkweed plants around his residence.

MAY 7, 1925.

The 233rd meeting of the Hawaiian Etomological Society was held at 2:30 p. m. at the Hawaiian Sugar Planters' Association Experiment Station, President Williams presiding. Other members present were Messrs. Bryan, Crawford, Ehrhorn, Lutken, Muir, Rosa, Swezey, Willard, and Van Zwaluwenburg. Dr. A. D. Imms, in charge of Entomology at the Rothamsted Experiment Station at Harpenden, England, was a visitor.

The minutes of the April meeting were read and approved.

Doctor Imms was asked to make a few remarks. He outlined the founding and development of the Rothamsted Experiment Station, and gave a very interesting review of the entomological work being carried on there.

PAPER.

"Some Observations on the 'Silverfish' Lepisma Saccharina."

BY HELENE MORITA
University of Hawaii.
(Presented by D. L. Crawford.)

NOTES AND EXHIBITIONS.

Lyctus planicollis Leconte.—Mr. Willard exhibited specimens of this powder-post beetle taken by him in the United States

*These were later determined as *Aeolomorphus rhopaloides* Walker.—Editor.

Army warehouses at Schofield Barracks, April 16, 1925. He exhibited also hardwood tool-handles, which had been badly attacked by this beetle.

Orneodes objurgatella Walsm.—Mr. Swezey exhibited specimens of this moth reared from the seeds of *Plectronia odorata*. He had collected 136 fruits from a *Plectronia* tree at about 1000 feet elevation at Keawaula, toward the northwest point of Oahu, April 12. From these fruits, between April 20 and May 1, one hundred *Orneodes* moths had issued, showing a very high infestation. There had also issued six specimens of *Heterocrossa* sp. and one *Secodella metallica* (Ashm.), the latter being a parasite on one of the others.

Insects from Rotten Plumieria.—The following insects were reported as having been reared from rotten *Plumieria* stems by Mr. Swezey. On April 4, Mr. Giffard brought in half a dozen dead branches cut from his *Plumieria* trees. They were badly infested with larvae of a cerambycid beetle. From April 6 to May 6, a large number of insects issued from these branches where contained in a large glass jar. The following is the list:

Five *Lagocheirus obsoletus* Thoms.
Four *Lagocheirus obsoletus* pupae, remaining in branches.
Four *Lagocheirus obsoletus* larvae, remaining in branches.
Hundreds of a Mycetophillid.
Few Psychodids.
Two or three other Diptera.
Eight *Opogona aurisquamosa* (Butl.).
Nine *Opogona purpuriella* Sw.
One *Arcocerus fasciculatus* (DeGeer).
Five *Dactylospermum abdominale* (Fab.).
Four small Staphylinids.
Numerous Acari on the *Lagocheirus* and *Dactylospermum* beetles.

Stenommatus musae Marshall.—Mr. Swezey reported having received a recent letter from Dr. G. A. K. Marshall in which was the following mention of this small banana weevil: "You will remember that in 1920 I described a species of *Stenommatus* which you found breeding in numbers in the root of a

banana plant. It may interest you to know that I recently received some Cossonids found in a similar position on bananas in South Africa. These bananas had been imported from Java. Five specimens were represented, four of which proved to be a new species of *Pentarthrum*, and the other was a specimen of *Stenommatus musae*. It seems, therefore, fairly certain that your insect must have been imported in bananas from the East."

JUNE 4, 1925.

The 234th meeting of the Hawaiian Entomological Society was held at 2:30 p. m. at the Experiment Station, Hawaiian Sugar Planters' Association. In the absence of president, vice-president, and secretary, Mr. Muir was selected to take the chair. Other members present were Messrs. Bryan, Crawford, Ehrhorn, Rosa, Swezey, and Van Zwaluwenburg. Mr. F. C. Hadden, a recent graduate in Entomology from the University of California, was a visitor.

Mr. Bryan was appointed to act as secretary. The minutes of the May meeting were read and approved.

Mr. Hadden, who had been president of the Entomology Club of the University of California, brought greetings from some of its members.

PAPER.

"Table for Distinguishing the Hawaiian Species of the Genus Dryophthorus of Curculionidae, Cossoninae (Coleoptera)."

BY O. H. SWEZEY.

NOTES AND EXHIBITIONS.

Thecla echion Linn.—A specimen of this butterfly was exhibited by Mr. Swezey, which he had reared from a larva found feeding on the green fruits of *Solanum nodiflorum* growing in a cane-field of Oahu Sugar Company, Waipahu, Oahu, May 11, 1925. This is one of the Lantana butterflies introduced from

Mexico in 1902. The larvae feed normally on Lantana flowers, but they have been found a few times feeding on fruits of the eggplant in gardens. This is the first record on the weed above mentioned.

Ilburnia leahi (Kirk.).—Mr. Swezey reported collecting this delphacid leafhopper on *Lipochaeta integrifolia* at Kaena Point, Oahu, May 31. This is the opposite extremity of the island from where it was first discovered, as it was described from Diamond Head (Leahi) by Kirkaldy, where he found it in 1904. This was the first species of Hawaiian Delphacidae described by Kirkaldy. Up to the present, 145 species and varieties have been described in this family.

Types of Tanager Expedition Coleoptera.—Mr. Bryan exhibited the type specimens of sixteen new species of Coleoptera collected in 1923 on the Tanager expeditions, and recently returned to the Bishop Museum by Doctor Perkins. He also read extracts from Doctor Perkins' paper, which will be published by the Bishop Museum as part of the report of the expeditions. The new species include twelve Rhyncophora, two Proterhinus, a Plagithmysus and a Cis, as follows:

Plagithmysus nihoae, Nihoa Island, on Euphorbia.

Dryotribus solitarius, Pearl and Hermes Reef.

Pentarthrum halodorum, Midway and Ocean Islands.

Pentarthrum pritchardiae, Nihoa Island, on Pritchardia.

Oodemas neckeri, Necker Island.

Oodemas breviscapum, Nihoa Island, on Euphorbia and bunch grass.

Oodemas erro, Nihoa Island, on Euphorbia.

Rhyncogonus exsul, Nihoa Island, on bunch grass.

Rhyncogonus biformis, Necker Island.

Rhyncogonus fallax, Wake Island, on a Tournefortia tree.

Sphaerorhinus pallescens, Wake Island.

Sphaerorhinus sordidus, Wake Island.

Acalles wilkesii, Wilkes Island (Wake Island), on Sida.

Proterhinus bryani, Nihoa Island, on Euphorbia.

Proterhinus abundans, Nihoa Island, on Euphorbia.

Cis vagans, Nihoa Island, on Euphorbia.

Among the specimens returned by Doctor Perkins is the type

of *Rhyncogonus bryani* Perkins, collected by W. A. Bryan on Laysan, and described in the Ent. Mo. Mag., 1919, p. 4. This unique specimen and the other types will be deposited in the Bishop Museum.

New Species of Lucilia.—Mr. Bryan exhibited a series of specimens of *Lucilia graphita* Shannon, a new species described for specimens found on Laysan Island, Pearl and Hermes Reef, Ocean Island, and Midway Island by the Tanager expeditions. It differs from all other species of Lucilia, in being very dark, almost the color of graphite. The description will be published in the report of the expeditions.

Discomyza maculipennis.—Mr. Bryan exhibited a series of this small black ephydrid fly, recently identified by Mr. E. T. Cresson, Jr. This is the first record in Hawaii of a species which is distributed from the East Indies to the West Indies. The species was recently bred in abundance from some improperly cleaned sea shells at the Bishop Museum, brought back from one of the Whippoorwill expeditions. Specimens had also been collected by Bridwell in Honolulu (no date; about 1917), and one specimen by Bryan, Oahu plantation, September 22, 1922.

Olfersia spinifera Leach.—Mr. Bryan exhibited a series of specimens of this hippoboscid parasite on frigate birds, which had been found in abundance on the islands visited by the Tanager expeditions, 1923. That it also occurs occasionally on the main islands of the Hawaiian group, is shown by a specimen collected at Puu Ka Pele, Kauai, September 4, 1920, by O. H. Swezey. This species was determined by Malloch. One other species, *O. arcuata* Speiser, is recorded in the Fauna Hawaiiensis from Hawaii, on frigate birds.

Itodacnus n. sp.—Mr. Bryan exhibited specimens of this elaterid beetle, which had been collected on Necker Island, 1923. He quoted Mr. Van Zwaluwenburg, who is working up the elateridae, as saying that this species is closely allied to species of this genus on Kauai, the larvae being almost indistinguishable.

After an informal discussion of the safeguarding of collections and reference libraries, the meeting adjourned at 3:45 p. m.

JULY 2, 1925.

The 235th meeting of the Hawaiian Entomological Society was held at the usual place, Vice-President Willard in the chair. Other members present were Messrs. Bryan, Crawford, Ehrhorn, Giffard, Illingworth, Lutken, Muir, and Swezey. Mr. H. S. Sharp was a visitor.

In the absence of the secretary, Mr. Bryan was appointed to fill that office. The minutes of the previous meeting were read and approved.

The name of Mr. F. C. Hadden was proposed for membership in the society.

Mr. Bryan presented the manuscript of an index to volume 5 of these proceedings.

NOTES AND EXHIBITIONS.

Engytatus geniculatus Reuter.—Mr. Swezey reported collecting this new immigrant bug on tomato-vines growing as a weed in cane-fields at Kahuku, June 26. This is the only place he had collected it since having first found it on tomato-vines in his garden in Manoa in August, 1924. It indicates that it is very widely spread on Oahu.

Lysiphlebus testacipes Cress.—Mr. Swezey reported the finding of *Aphis medicaginis* abundantly parasitized by this braconid on *Portulaca oleracea* in a cane-field at Waialua, June 26. This aphid parasite was introduced from California in February, 1923. It was abundantly spread about Honolulu, but none was liberated in the vicinity of Waialua. It has apparently become widely spread of itself during the two years since its introduction. It has been common on *Aphis maidis* on corn at both the Federal Experiment Station and University of Hawaii farm.

Head Capsules and Mouth-Parts.—Mr. Muir stated that he had been investigating the homologies of the head of Homoptera. He has concluded from these investigations that the sclerite known as the *lora* was the homolog of the *gena* and was not a part of the mandible, as stated by Smith and accepted by Comstock.

Monomorium pharaonis Linn.—Doctor Illingworth reported this

ant as bothering passengers in their bunks on board a passenger steamer on the trip over from Los Angeles. Mr. Ehrhorn stated that this ant is common on vessels, and is also a house ant in Hawaii. A discussion followed on the spread of insects by shipping. It was mentioned that, while the common house-fly of North America and Europe, *Musca domestica* Linn., is frequently abundant on vessels, it is seldom if ever captured in Honolulu. Our house-fly is the Oriental and Pacific species, *Musca vicina* Macquart. Attention was called to the abundance of flies in southern California.

AUGUST 6, 1925.

There being no quorum, no meeting was held.

SEPTEMBER 3, 1925.

The 236th meeting of the Hawaiian Entomological Society was held at the usual place, President F. X. Williams in the chair. Other members present were Messrs. Bryan, Giffard, Hadden, Illingworth, Swezey, and Van Zwaluwenburg. Miss Gertrude Henderson was a visitor.

The acting secretary was authorized to record that a meeting had been called for August 6, but adjourned for lack of a quorum.

Upon motion of Mr. Giffard, the rules were suspended and the acting secretary cast a unanimous ballot electing Mr. F. C. Hadden an active member.

PAPERS.

"Descriptions of New Species of the Dipterous Family Ephydridae from Hawaii."

BY E. T. CRESSON, JR.,
Academy of Natural Sciences, Philadelphia.

(Presented by E. H Bryan, Jr.)

"Additional Notes on the Insects on Mauna Kea and Mauna Loa."

BY E. H. BRYAN, JR.,

NOTES AND EXHIBITIONS.

California Beetles.—Mr. Hadden exhibited a named collection of the larger beetles which he had collected in California.

Euscepes batatae Waterhouse.—Mr. Bryan exhibited a series of this weevil, and reported that he had found it very abundant in a number of sweet potatoes purchased at a local market. The sweet potatoes were riddled with holes, in which the grubs were abundant.

Hypothenemus ruficeps Perkins.—Mr. Van Zwaluwenburg reported that this scolytid was reared from a log of *Spondias* sp. brought in by Mr. McEldowney, August 19. This specimen agrees closely with one identified by Mr. Swezey, except that it has a dark suffusion on the posterior third of the pronotum.

Cyrtorhinus mundulus (Bredd.) — Mr. Van Zwaluwenburg stated that adults and nymphs of this bug were found in cane-fields at Hana, Maui, June 26. This is the first record of this species from eastern Maui.

Ammophorus insularis Boh.—Mr. Hadden reported that he and Mr. Swezey had captured specimens of this rare tenebrionid beetle under rocks and refuse on Ewa Coral Plain, September 2.

Sarcophaga plinthopyga Wd.—Doctor Illingworth stated that he had bred three specimens of this fly from maggots collected on dead fish near Makapuu Point last April. This is a new name for *S. robusta* Aldrich, the correction having been made by Doctor Aldrich after seeing Wiedemann's type. This species was first found in Hawaii by Doctor Illingworth in 1917 (Proc. Haw. Ent. Soc., III, p. 383), breeding in meat. He recently found it very abundant in southern California. It closely resembles our common large *Sarcophaga barbata*, but may be distinguished by the characters given in Mr. Timberlake's key (Proc. Haw. Ent. Soc., III, pp. 371-2). One other specimen was captured by Mr. Swezey in Kaimuki, March 14, 1921.

Ichneumonid.—Mr. Swezey exhibited two specimens of a new immigrant ichneumonid which issued from chrysalids of *Vanessa cardui.* The caterpillars of this butterfly were collected on a roadside weed on Mount Tantalus, July 4.

Holochlora japonica Brunn.—Mr. Swezey reported finding this large katydid in a cane-field of the Waialua Agricultural Company, July 15. It was near Kawaihapai, and is the farthest from Honolulu that the occurrence of this insect has been noted.

Engytatus geniculatus Reuter.—Mr. Swezey reported the finding of this bug on tomato-vines at Kailua, July 12, and at Ewa Plantation, July 3. This shows that the bug is very generally spread on Oahu, as it was previously reported from Manoa Valley and from Kahuku.

Archytas sp.—Mr. Swezey reported the capture of this Mexican tachinid in the forest of Opaeula, July 19, also on Olomana needle, July 12, thus indicating further the spread of this fly on Oahu. Mr. Williams stated that he had observed it feeding on Cyathodes at the southeast base of Mount Kaala, elevation about 1500 feet.

Omiodes blackburni (Butl.).—Mr. Swezey reported that the coconut leaves of palms on Kauai were in very perfect condition and not badly injured by this leaf-roller. Examination disclosed that the cocoons of *Cremastus hymeniae* were very numerous, and explains the condition of the leaves. Seventeen caterpillars were found on a palm at the Lihue Hotel. Of these, sixteen yielded the parasite *C. hymeniae.* Mr. Giffard stated that coconut palms on the Kona coast were also in fine foliage. Those at Honaunau, Napoopoo, and Kailua, formerly badly eaten, were now quite free from the marks of leaf-roller caterpillars.

Vespa occidentalis Cresson.—Mr. Swezey reported collecting this wasp in Olokele Canyon, Kauai, August 21. This is some distance from places of previous record on that island, it being very common in the Kokee region and between there and the Na Pali coast.

Maruca testulalis Geyer. — Mr. Swezey reported rearing this moth from string beans and lima beans at Waimea, Kauai, in August. This is the first record of its occurrence on that island,

Pseudococcus nipae (Mask.).—Mr. Swezey reported that this mealybug is becoming rare on avocados, figs, etc., on Kauai. This is no doubt due to the activity of its introduced parasite, *Pseudaphycus utilis* Timberlake. Mr. Giffard stated that the same was true on Hawaii.

OCTOBER 1, 1925.

The 237th meeting of the Hawaiian Entomological Society was held at the usual place. There being none of the officers present, Mr. Giffard was chosen to take the chair, and Mr. Bryan to act as secretary. Members present were Messrs. Bryan, Giffard, Hadden, Rosa, Swezey, and Van Zwaluwenburg. Miss Henderson was a visitor.

The minutes of the previous meeting were approved as amended.

NOTES AND EXHIBITIONS.

Canadian Butterflies.—Mr. Swezey exhibited several boxes of butterflies collected by him in Canada, around Banff and Mount Asiniboine, and a few also in California in 1922.

Plagithmysus New Species from Kauai.—A fine specimen of what appears to be a new species of Plagithmysus beetle was exhibited by Mr. Swezey. It had issued from a piece of dead branch of Pipturus tree collected at Kumuwe'a Ridge, Kauai, August 16, 1925.

Aphis maidis Notes.—Mr. Hadden reported his observation of the rapid rate of reproduction of this species of plant louse under favorable conditions. He found that one female would in twenty-six days produce 334 offspring, and that within fifteen days these were in turn ready to reproduce. If all lived, at this rate there would be ten billion descendants in three months and twenty-five billion in four months.

Lyctus sp.—Mr. Van Zwaluwenburg reported rearing a specimen of this powder-post beetle from a block of *Spondias* sp. grown on Vineyard Street, and brought in by Mr. McEldowney.

This was apparently the same species that was reared from an oak panel at Paia, Maui, by Mr. Swezey in 1918. Its numbers in this instance indicate its firm establishment on Oahu. [It was later determined by Doctor Van Dyke as *Lyctus linearis* (Goetze), a cosmopolitan species.—Ed.]

Tineola bisellicla Hum.—Mr. Van Zwaluwenburg reported that a specimen of this tineid moth had been reared from a horse-hair girth brought in by Doctor Lyon. This species does not make a case, but works within a loose web. It has been previously found eating brushes at the College of Hawaii by Doctor Illingworth, and was reared by Mr. Giffard from an old woolen hat at his bungalow at Twenty-nine Miles, Olaa, Hawaii, in 1923.

Paratenodera sinensis (Sauss).—Mr. Bryan exhibited a specimen of this Oriental preying mantis, which had been captured by Miss Carey D. Miller, of the University of Hawaii faculty, at her home in Manoa Valley, September 25. The specimen was inside the house, which is near the end of the Manoa car line, and its presence indicates that the descendants of the egg masses brought from Kohala by Mr. Swezey in June, 1922, have become well established. (See Proceedings, VI, p. 9, 1924.)

Formicaleo perjurus Walker.—Mr. Bryan exhibited a specimen of ant-lion captured by Mr. A. F. Judd at Kaupao on the dry west end of Molokai, July 18, 1925. It is the first record of an ant-lion on Molokai, and is probably *Formicaleo perjurus* Walker, but no description, or specimens, are available for making positive determination. *F. perjurus* was first collected on Oahu (Beechey expedition) and on Maui by Blackburn, hence this is quite likely to be the same species. Furthermore, the specimen is smaller than *F. wilsoni*, occurring commonly in certain dry regions on Hawaii, and it lacks the blackish clouding of the nervules which gives an irrorated appearance to the fore-wings of *wilsoni*. Both of these characters are mentioned by McLachlan in comparing the two species when he described *wilsoni*. (See Ann. Mag. Nat. Hist. (6), X, p. 179, 1892.)

Genitalia of Hawaiian Plagithmysides.—Mr. Giffard reported that, during a study of certain species of the cerambycid group Plagithmysides, the dissection of the male genitalia of remote

species in each of the genera Plagithmysus, Clytarlus, and Callithmysus, indicated that the characters in each were identical, or at most, if any slight difference at all, it was unimportant. The species dissected were, as follows:

One *Plagithmysus darwinianus* Shp., Kilauea, Hawaii, 4000 feet elevation.

One *Plagithmysus aequalis* Shp., Waimea Mountains, Kauai, 4000 feet elevation.

One *Plagithmysus pulverulentus* Motsch., Tantalus, Oahu, 1500 feet.

One *Clytarlus pennatus* Sharp, slopes Haleakala, Maui, high elevation.

One *Callithmysus cristatus* Sharp, Tantalus, Oahu, 1500 feet elevation.

Each of the above species is confined to the island specified.

The remainder of the meeting was devoted to a discussion of the features of Plagithmysus, and the distribution and habits of this and other endemic forest insects.

NOVEMBER 5, 1925.

The 238th meeting of the Hawaiian Entomological Society was held at the usual place. There were present Messrs. Hadden, Willard, Van Zwaluwenburg, Giffard, Muir, Swezey, Rosa, Williams, Bryan, Crawford, Illingworth and Fullaway, members; and Miss Henderson, visitor.

The minutes of the previous meeting were read and approved with corrections.

A vote of thanks to the trustees of the Hawaiian Sugar Planters' Association for printing 1924 Proceedings was moved, duly seconded and carried.

Mr. Irwin Spalding was proposed for membership by Mr. Giffard, and seconded by Mr. Muir.

PAPERS.

"Mango Weevil—Correction of Name."

BY O. H. SWEZEY.

"Kilauea Moths."

BY O. H. SWEZEY.

NOTES AND EXHIBITIONS.

Monocrepidius exsul Shp.—Mr. Van Zwaluwenburg recorded the collection of a larva of *Monocrepidius* on Eastern Island, Midway, by Tanager expedition. Presumably the form present is *M. exsul*.

Egg-Sucking Habit of Heteroptera.—Mr. Muir recorded Mr. Pemberton's observation in the Philippine Islands of egg-sucking bugs in connection with weevils.

Ataenius inops Horn.—Mr. Swezey exhibited a specimen of this aphodiid beetle which had been collected from soil containing a good deal of decaying vegetable matter at Honolulu, May 15, 1924. Apparently this beetle has not been previously recorded here. At the Bishop Museum are two specimens collected by Bridwell, Honolulu, 1917, without reference to habitat.

Dryophthorus pusillus Shp.—Mr. Swezey exhibited a specimen of this cossonid weevil collected by Mr. Williams in a dead stem of Cibotium in Kohala, Hawaii, September 28, 1925. The species is common in the tree-ferns of Mount Tantalus, Oahu, and this is the first record of it from another island. In the Fauna Hawaiiensis it is recorded as collected by Blackburn on Oahu "in stems of the tree-fern." Doctor Perkins remarked that he had never met with the species. Later, he became familiar with it on Tantalus, where it was also collected by Mr. Giffard.

Tineola uterella Walsm.—Mr. Swezey reported that in an examination of a lot of seventy-nine larval cases of this tineid moth collected in basement of the experiment station building, 70 per cent had been parasitized, as revealed by the presence of the white cocoons of the parasite inside the cases. All had previ-

ously issued, both the moth and its parasite, *Protapanteles hawaiiensis* Ashm., except that two of the cases contained larvae of the moth. An examination of fifty larval cases collected in the basement of his house in Manoa showed 58 per cent had been parasitized.

Spalangia cameroni Perkins.—Mr. Swezey reported having reared seventeen of this parasite from fifty-three puparia of the horn-fly collected at Gilbert, Oahu, September 2, 1925. This is equivalent to 32 per cent parasitization, and was rather unexpected, as it is such a dry region and very hot at the time, and seemed very unfavorable for parasites of any kind. One of the same parasites issued from a puparium of *Limnophora arcuata* Stein, an anthomyid, collected in cow-dung along with the horn-fly puparia.

Microbracon pembertoni, a Synonym of M. mellitor Say.—Mr. Willard called attention to the fact that this braconid was considered a new species in 1918, when it was described by J. C. Bridwell and named *Microbracon pembertoni*. (Proc. Haw. Ent. Soc., IV, No. 1, p. 115, 1919.) C. W. F. Muesebeck, in "A Revision of Parasitic Wasps of the Genus Microbracon Occurring in America, North of Mexico" (Proc. U. S. Nat. Museum, 67, No. 2580, p. 65, 1925), after comparing paratypes of *pembertoni* in the United States National Museum with Say's description of *mellitor* in 1836, considers *pembertoni* a synonym of *mellitor*.

The Stimulus of Microbracon mellitor to Attack and Oviposition.—While studying the life history of this parasite, Mr. Willard found that the stimulus to attack its host and oviposit occurred only when the host larva was enclosed by some covering. In nature, the caterpillar of the pink bollworm, *Pectinophora gossypiella* Saunders, is stung and oviposition occurs while it is within the cotton boll. In the laboratory also, attack and oviposition upon caterpillars within bolls was secured without difficulty; but no notice was taken of caterpillars that had been removed from the bolls and allowed to crawl about in the parasite cages. Oviposition was readily secured by enclosing a caterpillar in a gelatin capsule about one-half inch long, such as physicians use for administering powders, and which had been perforated

in several places by a needle-point. When a larva enclosed in this manner was placed in a cage with gravid females, the stimulus was immediately evident. A female would soon locate one of the perforations, through which it would sting and paralyze the larva. That the stimulus was due to a moving larva within a covering, is further indicated by the fact that *M. mellitor* readily stung, and oviposited upon, maggots of the melon-fly *Bactrocera cucurbitae* (Coq.), which were similarly placed in gelatin capsules. The poison injected by the parasite killed instead of paralyzing the maggots, which soon began to decompose, and the larvae which hatched from the parasite eggs could not develop. The stimulus to attack was also shown in the case of the larvae of the Mediterranean fruit-fly, *Ceratitis capitata* Wied., in fruits of *Mimusops elengi*. One of these fruits, the skin of which had been perforated with a needle, and which contained nine *C. capitata* larvae, was placed in a cage with female *M. mellitor*. Within two hours all the maggots had been stung and killed; but no eggs were found in the fruit.

By using transparent gelatin capsules, as previously described, and glass sterilizing tubes as parasite cages, the process of stinging, paralyzation and oviposition was clearly visible through a binocular microscope. When a perforation in the capsule was located, the parasite inserted its ovipositor rather cautiously until it came in contact with the caterpillar. The ovipositor was then given a quick thrust, and immediately withdrawn. During the fraction of a second required for the thrust, the skin of the caterpillar was pierced and enough poison injected to cause paralyzation. After the ovipositor was withdrawn, the parasite rested several minutes and again inserted the ovipositor, pricking the caterpillar several times to ascertain the degree of paralyzation. As soon as the larva became quiet, an egg was deposited upon it.

Mating of Parisierola emigrata Rohwer.—Mr. Willard submitted the following note on the mating habits of this bethylid. Mating occurs within the cocoons, which are spun by the mature larva near the remains of the host caterpillar, and in which the pupa stage is passed. The males in each group of cocoons emerge from one to two days before the females. The proportion of males to females is about one to four. The males gain access

to the females by biting holes in the cocoons through which they enter. These holes serve as emergence holes for the females subsequent to mating. Large numbers of adults were under observation, but no attempts to mate were observed after the females had emerged. Many instances of mating within the cocoon of the female were distinctly seen through the binocular microscope.

Lycaenid Larva Attacking Litchi in Hong Kong.—Mr. Fullaway exhibited specimens of the lycaenid butterfly *Deudorix epijarbas* Moore reared from larvae found destroying the fruits of the litchi in Hong Kong.

California Cerambycidae.—Mr. Hadden exhibited a collection of California Cerambycidae made previous to his return to the Islands in 1925.

DECEMBER 3, 1925.

The 239th regular meeting of the Hawaiian Entomological Society was held at the Experiment Station of the Hawaiian Sugar Planters' Association at 2:30 p. m., President F. X. Williams presiding. Other members present were Messrs. Bryan, Ehrhorn, Giffard, Hadden, Muir, Rosa, Swezey, Van Zwaluwenburg, and Willard. Miss G. Henderson was a visitor.

In the absence of the secretary, Mr. Willard was appointed secretary pro tem.

Owing to the illness of the secretary, the minutes of the previous meeting were not at hand.

Mr. Irwin Spalding was unanimously elected an active member of the society.

The following officers were unanimously elected for the year 1926: President, H. F. Willard; Vice-President, R. H. Van Zwaluwenburg; Secretary-Treasurer, E. H. Bryan, Jr.

Executive Committee: W. M. Giffard, F. Muir.

Mr. Muir reported that an effort was being made by the Pan-Pacific Union to have Honolulu made the 1928 meeting place of the International Entomological Congress. He remarked that

the entomologists of Honolulu had met at the Pan-Pacific Research Institute and heartily endorsed this effort. The Pan-Pacific Union appointed the following committee to work toward obtaining this meeting for Honolulu: F. Muir, W. M. Giffard, and D. L. Crawford. Mr. Muir stated that the Pan-Pacific Union had sent word to Dr. L. O. Howard, asking him to put the matter before the entomological section of the American Association for the Advancement of Science at their meeting in Kansas City in December, 1925, asking him to advise the members of the section of the attitude of the Pan-Pacific Union and the entomologists of Honolulu, and urgently request that the meeting be held here in 1928.

Upon motion by Mr. Giffard, it was voted that the Executive Committee draft appropriate resolutions strongly endorsing the above effort by the Hawaiian Entomological Society, and that a copy of these resolutions be forwarded to the Pan-Pacific Union, and one be embodied in the minutes of the society.

ADDRESS OF THE RETIRING PRESIDENT

"Some Spider Wasps of the Family Psammocharidae or Pompilidae." *

BY DR. F. X. WILLIAMS.

PAPERS.

"Notes on Hawaiian Orthoptera."

BY MORGAN HEBARD.

(Presented by E. H. Bryan, Jr.)

"New Hawaiian Chalcid-Flies."

BY P. H. TIMBERLAKE.

(Presented by title by O. H. Swezey.)

* This paper is not published herewith, as it is embodied in an entomological bulletin to be issued soon by the Experiment Station, Hawaiian Sugar Planters' Association.—Editor.

"A New Species of Fruit-fly Parasite from Formosa (Braconidae)."

BY D. T. FULLAWAY.

(Presented by title by H. F. Willard.)

"Arrenophagus Albipes Girault in Hawaii."

BY O. H. SWEZEY.

"Casinaria Infesta (Cress.) in Hawaii." *

BY O. H. SWEZEY.

"Some Remarks on Dr. Hem Singh-Pruthi's Paper on the Morphology of the Male Genitalia in Rhynchota."

BY F. MUIR.

NOTES AND EXHIBITIONS.

Latrodectes mactans Fabr. — Mr. Hadden reported taking a specimen of this spider, called the hourglass spider, black widow, or shoe-button spider, on the lower slopes of Koko Head, November 25, 1925. The spider had utilized a hole in the ground and some of the surrounding brush to make a nest in. When first seen it was clinging upside down near the mouth of the funnel of its web, so that the red hourglass on its abdomen could be plainly seen. When found it was feeding on the larva of *Spodoptera maurita*. Reference: W. B. Herms' "Medical and Veterinary Entomology, 1923."

Stictocephala festina (Say). — Specimens of this membracid, which were taken at Kahala (Waialae Ranch) on November 13, 1924, were exhibited by Mr. Hadden. Mr. Bryan reported it

*In connection with this paper, Mr. Swezey exhibited also a closely related species which he had reared from cocoons found at Waialae Ranch, Oahu, October 28, 1925, the first observance of this new immigrant in Hawaii. Specimens were sent later to the United States Bureau of Entomology, Washington, D. C., where Mr. Cushman identified them as *Hyposoter exiguae* (Vier.), originally described from California.—Editor.

having been taken on the University of Hawaii grounds by students. It is found here on alfalfa and grasses, and is probably a new immigrant from California, brought here on hay. It is found in California, Mexico, Arizona, Texas, Colorado, Pennsylvania, and throughout the southern states and in the West Indies.

Phloebius sp.—Mr. Bryan reported that a specimen of anthribid beetle, which had been collected by Mr. Bissell on a window of the Vida Villa Hotel, Honolulu, January, 1923 (see Proc. Haw. Ent. Soc., V, 5, p. 344), had been sent to Mr. A. M. Lea of Adelaide, South Australia, for determination. Mr. Lea had returned the specimen with the following note: "We have nothing exactly like it in our collections, but it would be hardly good enough to name a single specimen so close structurally to *P. gigas*, of which I send sexes for comparison." *Phloebius gigas* Fabr. is a fairly common species in Queensland. The immigrant found in Honolulu is a very closely allied species.

Aphelinus maidis Timb.—Mr. Swezey reported as follows on the hyperparasitism of this aphid parasite by *Aphidenencyrtus schizoneurae* Ashm.: *Aphis sacchari* at Experiment Station, Hawaiian Sugar Planters' Association February 16, 1925, 99 per cent hyperparasitized; ditto, March 6, 98 per cent. *Aphis maidis* at Makiki nursery, June 17, 1925, 56 per cent; ditto, June 29, 40 per cent. *Aphis sacchari* at Waialua, October 9, 1925, 54 per cent. *Aphis maidis* at Hind-Clarke dairy, Wailupe, November 13, 1925, 60 per cent.

Melittobia hawaiiensis Perk. — Mr. Swezey reported rearing this eulophid from a Megachile nest collected at Waimea, Kauai, August 8, 1925. The Megachile nest was in the groove of a tongue-and-groove board in a lumber-pile. There were seventeen cells in the nest, and Melittobia issued abundantly from fifteen of the cells; the other two contained dead larvae. This equals 88 per cent parasitization, and indicates a strong check on the Megachile. The species of the latter was probably *timberlakei* Cockerell. Both it and *palmarum* Perk. are known to occur there. The nest appeared to be of the former, however, although no bees issued from the nest.

Spodoptera mauritia (Boisd.) — Mr. Swezey reported having found an extra large cluster of eggs of this moth on a grass-leaf, and on counting them, found there were 586 in the cluster.

Pseudococcus boninsis (Kuwana).—Mr. Ehrhorn called attention to a paper by Mr. Harold Morrison, on the "Identity of the Mealy Bug Described as *Dactylopius calceolariae* Maskell" which was published in the September 1, 1925, issue of the Journal of Agricultural Research. In this paper it is pointed out that the gray sugar-cane mealybug, which has been identified by many as *Pseudococcus calceolariae*, is not *calceolariae* at all, but *Pseudococcus boninsis* (Kuwana), which was described from sugar-cane from the Bonin Islands by Kuwana in 1909. Reference: Jour. N. Y. Ent. Soc., 17, p. 161, 1909.

Death of Dr. Maxwell Lefroy.—Mr. Swezey called attention to the recent death of Professor Maxwell Lefroy, and read a newspaper clipping from a London paper which described the circumstances surrounding his death.

Observations on Chrysomyia Megacephala (Fabr.), Our Common Blow-Fly, in the Orient.

BY J. F. ILLINGWORTH.

(Presented at the meeting of January 8, 1925.)

As I have already reported, I was interested to find that this subtropical Indian species had extended as far north as Japan. Yet it was very rarely seen in the vicinity of Yokohama, the climate evidently fixing this as the northern limit.

In Central China, on the other hand, I found this species to be the predominant fly in the valley of the Yangtze. It is the one against which all the fly campaigns of that thickly populated region are waged. Strange to relate, however, this species there shows a remarkable adaptation to man's habits of living. It is a common custom in Central and Southern China to conserve all human excrement in liquid form for use on the garden crops. This is stored in nooks and corners along the narrow streets, in large "kongs" (jars) about four feet across the tops. The fermenting mass "smells to heaven," being worse if anything than carrion, hence these flies have gradually become accustomed to breeding in it. The whole surface of the mass in each kong, during the summer, is packed with writhing maggots—not room enough for another one to get in edgewise. The jars are so constructed, however, that the maggots cannot crawl out when fully fed, due to a rim at the top. Nevertheless, the farmers and gardeners do just what is best to insure the breeding of the flies, for they dip out the top layer, from day to day, spreading it as fertilizer on the soil. The larvae then dig in and pupate contentedly, emerging in a few days to contaminate the foods, etc.

It is now generally recognized that the adults are very fond of sweets, and these substances are used in most of the fly-traps for baiting them. Foods exposed for sale in all of the small stalls along the narrow streets are covered with swarms of these blue flies. Hence it is not difficult to understand why such diseases as amoebic dysentery, typhoid, etc., are so prevalent there. The filthy habit, too, of spitting, so common in China, is attractive to these flies. You see them everywhere in the streets, feed-

ing on the sputum on the ground. Going from this straight to exposed food, or to the sticky mouths of children, it is not difficult to understand why tuberculosis is so widespread in China.

The missionaries at Soochow, in their attempt to check the flies early in the season while few in number, offered ten coppers per hundred. The thrifty Chinese, however, began bringing them in in enormous numbers. This led to an investigation, and it was found that some individuals, who had been specializing in breeding the maggots for duck feed, decided that it was far more profitable to rear the adult flies, selling them to the rich foreigners.

At Nanking the fly campaign was rather effective, though also expensive. There they used cyanide of potassium by the ton, under the direction of Professor Woodworth. Fifty of the native city police were delegated by the Governor to place a small amount of the poison in each exposed kong in the city, every few days. Just enough of the cyanide solution was used in each case to stop the activities of the writhing mass of maggots on the surface at each receptacle. This treatment cost the city, for the chemical alone, about 5000 Mexican dollars in 1923. Due to the exigencies of civil war, this appropriation was not supplied in 1924, and the blow-flies became distressingly abundant again.

HAWAIIAN REFERENCES TO *Chrysomyia megacephala* (Fabr.).

1907. Van Dine, Rpt. Haw. Agr. Exp. Sta., p. 47. (*Calliphora dux*.) Injurious blow-fly of sheep.

1907. Van Dine, Fifth Proc. Haw. Livestock Breeders' Assn., pp. 45-64. (*Calliphora dux*.) Full discussion of this sheep pest.

1908. Van Dine, Rpt. Haw. Agr. Exp. Sta., pp. 21, 36. (*Calliphora dux*). Discussed as the sheep maggot-fly.

1909. Terry, Proc. Haw. Ent. Soc., II, p. 91. (*Lucilia dux* Esch.). Observed as a carrion feeder in South China.

1916. Kuhns, Proc. Ent. Soc., III, p. 267. (*Lucilia dux*.) Reared from maggots on the beach.

1916. Swezey, Proc. Haw. Ent. Soc., III, p. 272. (*Chrysomyia dux* (Esch.) as determined by Knab.)

1917. Illingworth, Proc. Haw. Ent. Soc., III, p. 429. (*Chrysomyia dux*.) Referred to as the sheep maggot-fly of Hawaii.

1918. Bridwell, Trans. Med. Soc. Haw., 1916-17, p. 31. (*Pycnosoma dux*.) Carrion breeder which contaminates foods.

1922. Fullaway, Proc. Haw. Ent. Soc., V, p. 12. (*Chrysomyia dux.*) Collected at Waimea, Hawaii.

1923. Bryan, Proc. Haw. Ent. Soc., V, p. 193. (*Chrysomyia dux* Esch.) Exhibited specimen taken near Sydney.

1923. Illingworth, Proc. Haw. Ent. Soc., V, pp. 266-7. (*Chrysomyia megacephala* (Fabr.)). Synonymy, and notes on distribution.

1923. Illingworth, Proc. Haw. Ent. Soc., V, p. 277. Collected on shrubbery at Parker Ranch, Hawaii.

1923. Illingworth, Proc. Haw. Ent. Soc., V, p. 280. Breeding in carrion, Honolulu.

1924. Illingworth, Proc. Haw. Ent. Soc., V, p. 377. (*Chrysomyia megacephala* (Fabr.)) Further notes on distribution in the Orient.

The Genus Popillia with Its Natural Enemies in the Orient (Col.).

BY J. F. ILLINGWORTH.

(Presented at the meeting of February 5, 1925.)

In this paper I wish to briefly review the work as carried on in the Orient by the United States Department of Agriculture in their search for natural enemies of *Popillia japonica* Newm. Though this species is evidently confined to Japan, the Genus Popillia is widely distributed. Recorded species are very numerous, being in their order of abundance from India, China, Korea, Africa, Japan, Mexico, Manchuria, etc.

Clausen and King (1924)* have already given an excellent preliminary report on the work accomplished in Japan and Korea. The exceedingly effective tachinid parasite which they found in northern Japan was named *Centeter cinerea* by Doctor Aldrich (1923). This fly practically wipes out the beetles during the years of their abundance, i. e., alternate years, parasitizing more than 99 per cent of the females. The eggs are firmly glued to the dorsum of the thorax. Hatching, the maggots at once make their way through the hard chitin, quickly putting an end to the activities of the beetle. Since the maggot devours most of the internal anatomy, the host dies in about five days. The maggot then pupates within the empty, hard shell of the beetle, which makes it very convenient for handling and shipping them during their long dormant period. They do not emerge as flies until the following spring.

Hundreds of thousands of these parasitized beetles have been collected in northern Japan, and shipped to the laboratory at Riverton, New Jersey, where the issuing flies were liberated. A few parasitized beetles were found in the field near Riverton during the summer of 1923, as reported by Mr. Smith (1924). The past season (1924) gave further very encouraging evidence, for Mr. Smith wrote that beetles with eggs attached to the thorax had been collected in considerable numbers and over a wide area, far removed from the point of original liberations of the flies.

Proc. Haw. Ent. Soc., VI, No. 2, July, 1926.

* Figures in parentheses refer to bibliography.

Another, though less effective parasite of the adult beetles, is the yellow tachinid, found at Yokohama. Doctor Aldrich (1923) determined this as *Ochromeigenia ormioides* Towns. This fly is a most elusive creature. It is active only at night. We experienced the greatest difficulty in trying to learn something of its habits, and were unable to discover just how it parasitized the beetles. For this investigation we built a large screen cage, covering native food-plants of the beetles. In this we were able to observe that the flies remained absolutely motionless during the day, sitting wherever they chanced to be, either on the foliage, or on the screening of the walls. As soon as dusk approached, however, they became exceedingly active, running around the beetles and touching them with their antennae. Where the beetles were on the screen sides of the cage, the activities of the flies could be more easily followed in the semidarkness by getting down, so as to use the sky as a background. Under such conditions, I could see that the fly, with ovipositor extended and curved forward, ran quickly over the back of the beetle. This insect evidently was fully alive to its danger, for it remonstrated vigorously by kicking its hind legs over its back. The movement of the parasite was so rapid, however, and the light so poor, that I was unable to make out just when parasitism took place. At any rate, nothing was left on the surface of the beetle, for I examined such specimens by lamplight. Yet flies developed later from these beetles, demonstrating that the act had been accomplished.

Dissection of these yellow flies showed that they are viviparous—the eggs hatched within their body—so they evidently deposit the active larva upon the beetle. Hence, we may conclude that the maggot is possibly tucked under the wing covers, which are slightly raised during the struggle of the beetle to free itself of the troublesome parasite. At any rate, the maggot is quickly at work eating out the vitals of the host. Under most favorable field conditions, in the vicinity of Yokohama, about 35 per cent of the pest succumbed to this parasite.

Japanese parasites of the grubs of Popillia, so far discovered, are not as promising as the above. These are scoliid wasps belonging to the Genus Tiphia, and a dexiid fly (*Prosena siberita* Fabr.). This latter insect was exceedingly abundant in many

parts of Hokkaido during August, 1923, when making a hurried scouting trip of that island. On this trip we found the Pópillia beetles very scarce, but these natural enemies of the grubs were much in evidence. At Piuka, in northern Hokkaido, we also found scoliid wasps, belonging to the Genus Campsomeris, swarming over grub-infested soil along a railway embankment. Yet we were not able to devote sufficient time to digging to determine whether they were using Popillia for a host or not.

Both Tiphia and Campsomeris wasps were found also in Korea, parasitizing the grubs of related Popillia and Anomala beetles. A second species of dexiid was also found there breeding on these grubs.

In November, 1923, I went over to China to make a study of the natural enemies of the related species of Popillia, which are rather abundant in that country. The fact that these beetles are so prolific there would suggest that parasites are few in the country. In the valley of the Yangtze River we found the following, named in the order of abundance: *Popillia atrocoerulea* Bates, *P. indigonacea* Mots., *P. cyanae* Hope, and *P. quadriguttata* Fabr. We hired collectors to bring these in by the tens of thousands. Each individual beetle was examined for external parasites, and, furthermore, all those that died within a week after collecting were kept. From all of these, only two parasites emerged, and they were the yellow tachinids, like we found at Yokohama.

Farther south, at Foochow, *P. cyanae* and *P. quadriguttata* were the very abundant species, while we got a few of the subtropical *P. marginicollis* Hope. Here, again, no parasites of the adult beetles were discovered. Toads and other predators, however, were much in evidence, feeding on this easily procured food.

Scoliid wasps are considerably in evidence in China. At least three species of these were reared on Popillia grubs at our stations at Chinkiang, Nanking, and Hangchow. At the first of the above stations we bred out a species of Campsomeris wasp, but the life-cycle was so short that it could pass through several generations each season. Hence, it would probably require several hosts. A small species of Tiphia was fairly common, and very peculiar in that it deposited a black egg on the venter, just

behind the legs of the paralyzed grub. A larger Tiphia placed a white egg on the dorsum of the thorax of its host. These two most promising species were bred out in considerable numbers, the cocoons being easily forwarded to Riverton for liberation.

During this work in the Orient since its inception in 1920, more than a dozen true insect parasites of the Genus Popillia have been found. Several of them have been shipped in considerable numbers to the New Jersey laboratory. Great hopes are based upon the known efficiency of the tachinid, *Centeter cinerea* Ald. Yet the investigation is now being extended as far as India, and will be kept up until such time as the pest ceases to be a menace in the infested region of the eastern United States.

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1924. Hadley, C. H., The Japanese Beetle in Pennsylvania: Bull. Penn. Dept. Agric., No. 390, pp. 19.

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The Common Muscoid Flies, Occurring About Sweet-Shops in Yokohama, Japan.

BY J. F. ILLINGWORTH.

(Presented at the meeting of February 5, 1925.)

Stationed in Yokohama during June and July, 1923, I was interested in the swarms of flies congregated in shops where various sweets, wines, etc., were exposed for sale. In such places an attempt was being made to check these pests, using a most ingenious fly-trap. Finding that I could get quantities of specimens so easily, I decided to make a census of the comparative abundance of the species thus attracted to sweets.

From five traps, June 28 I got 163 flies. These were each examined with a lens, and separated into the following species:

		Per cent
Lucilia caesar (Linn.)	76	47.0
Calliphora lata Coq.	35	21.5
Muscina stabulans (Fall.)	24	15.0
Fannia scalaris (Fabr.)	15	9.0
Sarcophaga fuscicauda Böttch.	5	3.0
Lucilia sericata (Meigen)	4	2.5
Fannia canicularis (Linn.)	2	1.0
Musca convexifrons Thoms.	1	.5
Ophyra nigra (Weidemann)	1	.5
	163	100.0

It is interesting to note that not a single house-fly, *Musca domestica,* was taken in the above lot of flies. Indeed, I found this species remarkably scarce, even later in the summer, when other flies were very prolific. This is probably accounted for by the lack of favorable facilities for breeding. As is well known, Japanese cities have very few draught animals. Furthermore, even the little available manure from these creatures is at once put into maceration tanks, together with human excrement and other organic matter. In the treatment of this fertilizer material, it is so saturated that *domestica* has apparently not yet become sufficiently adapted to live in it. All of the other species listed above, however, I was able to breed out under such

conditions. They apparently live happily, side by side, in such a foul-smelling semiliquid, fermenting mass.

A month later, July 28, all of these species of flies had become increasingly abundant. Going over the 5250 taken from the traps, I got the following records:

		Per cent
Calliphóra lata Coq.	1765	33.62
Sarcophaga (mostly *fusciauda* Böttch.)	1156	22.00
Lucilia cacsar (Linn.)	809	15.40
Lucilia sericata (Meigen)	752	14.34
Muscina stabulans (Fall.)	283	5.38
Fannia scalaris (Fabr.)	256	4.88
Musca domestica Linn.	122	2.33
Fannia canicularis (Linn.)	72	1.37
Ophyra nigra (Weid.)	13	.25
Chrysomyia megacephala (Fabr.)	4	.08
Anthomyia bisetosa Thoms.	3	.06
Musca convexifrons Thoms.	2	.04
Chrysomyia sp. n.	1	.02
Miscellaneous small flies	12	.23
	5250	100.00

The above data goes to show that the danger to public health from such flies can hardly be overestimated. Breeding as they do in the Orient, under the most filthy conditions, frequently contaminated by disease germs of typhoid, etc., in human excrement, they come straight to the food of man. Of course it is well known that, in feeding, these flies must first liquefy the food before they can take it into their bodies. Watching a fly feeding on a dry piece of sugar or candy, one gets a vivid illustration of this. It first regurgitates a drop of contaminated liquid from its crop, which, by the way, is located away down in its abdomen. This liquid is at once applied to the dry surface of the sugar and rubbed about vigorously with the rasplike flabellum on the end of the fly's proboscis. The solution is then sucked in and forced out several times in a churning process before it is finally swallowed. Inevitably a part of the contaminated, germ-laden liquid is left on the surface of the sugar. Likewise, the same process takes place when we see the flies feeding at the corners of the sticky mouths of children. Hence it is not difficult to understand the tremendous mortality, especially among the young, in summer in the Orient.

Notes on Sarcophaga Fuscicauda Böttcher (Diptera).

BY J. F. ILLINGWORTH.

(Presented at the meeting of April 2, 1925.)

This subtropical species has been known in Hawaii for about twenty years, until recently going under the label "Sarcophaga sp." When I went to North Queensland in 1917 I again found it. In the warm humid districts along the coast of that state it is a particularly troublesome species, for it apparently is as closely associated with man there as even the house-fly itself.

Though it is an omnivorous feeder, breeding in almost any form of organic matter, it evidently favors human excrement. While located in the Cairns district, I bred out thousands of maggots from outdoor toilets, and found practically all of them belonged to this species. It was also a distressing pest about the insectary, frequently getting its maggots into the jars of parasitized beetles, and thus upsetting calculations.

Because of its extreme economic importance, I sent specimens from my Queensland laboratory to Dr. R. R. Parker for determination. November 14, 1918, he wrote that this species was *Sarcophaga fuscicauda* Böttcher. Mr. Timberlake later sent specimens from Honolulu to Doctor Parker for determination. These were referred to the same species. (See Proc. Haw. Ent. Soc., Vol. 4, p. 256, March 6, 1919.)

Doctor Parker wrote me December 11, 1922, referring to a recent paper, which I had sent him, by Johnston and Tiegs on the Sarcophagid flies of Queensland. Regarding the above species, he remarked:

"If Johnston's determination of *Sarcophaga irrequieta* Walker is correct, then *fuscicauda* Böttcher is synonymous."

Thinking that we might be able to clear up the confusion in this, the name of one of our most important economic species, I wrote to Doctor Marshall of the British Museum January 30, 1925, as follows:

"I am wondering if you cannot help us straighten out the name of one of our tropical species of sarcophagids. We have known

this fly for some time in Hawaii, and Mr. Timberlake included it in his "Key to Separate Hawaiian Sarcophaga" (see Proc. Haw. Ent. Soc., Vol. 3, p. 371, typed copy enclosed) as Sarcophaga sp. Later, Dr. R. R. Parker determined the species for me as *S. fuscicauda* Böttcher. I found these flies abundant about habitations in North Queensland.

"When Johnston and Tiegs worked the Queensland sarcophagids (see Proc. Roy. Soc. Qsld., Vol. 33, pp. 46-90), they decided that this was Walker's species *S. irrequieta* (1849). We do not have access to Walker's list, but I understand that his type is a female specimen, which is now in the British Museum.

"Since our species is so widely spread in the Pacific, and everywhere so closely associated with man, it is important to get it correctly determined.

"Using Timberlake's key, I believe it will be possible, even though Walker's type is a female, to clear this matter up.

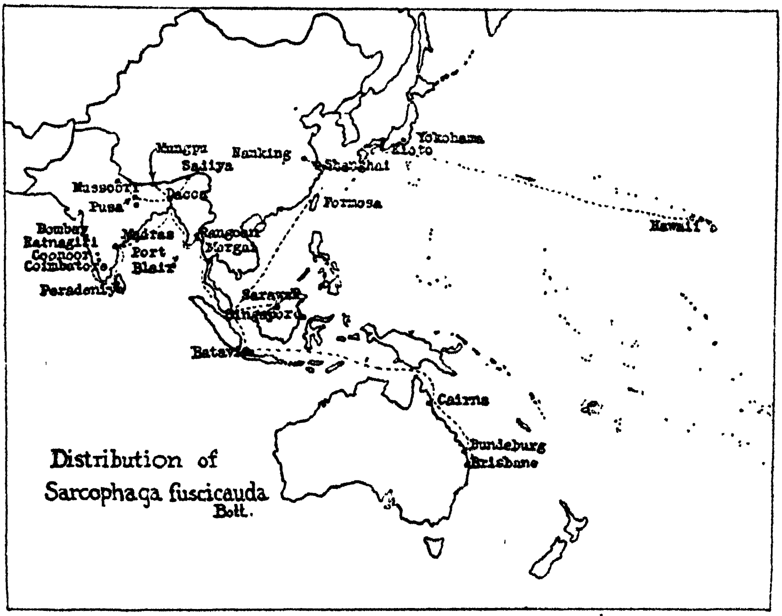
"I will send you some specimens of our species for comparison, also some of the same collected in Australia."

Doctor Marshall in his reply dated 26th of February, 1925, says:

"I have now carefully compared your specimens with Walker's type, and have also submitted them to Major Austen. We agree in thinking that it would be unwise to attribute your insects to Walker's species, although they are evidently extremely closely allied. Walker's specimen is in very bad condition, but there is no trace of any scars representing the intermediate pair of prescutellar bristles, and the front is undoubtedly broader in Walker's specimen than in any of your females. It will be difficult to clear up the exact identity of *S. irrequieta* until we have been able to obtain both males and females from the same locality in western Australia. Major Austen thinks it would be much wiser for you to retain your species under the name of *S. fuscicauda* Böttcher."

A very valuable paper on Oriental sarcophagids by Ronald Senior-White has recently appeared (see Records Indian Mus., Vol. 26, pp. 193-283, with 12 pls., May, 1924). Mr. White considers *S. fuscicauda* as a typical Malayan species. Yet his numerous data would make it appear that it is characteristically

Indian. From my collection in the Orient and Australia, I had come to this conclusion. That it is essentially a subtropical species, I do not think there is any doubt. I found it along the whole coast of Queensland, extending in diminishing numbers as far south as Brisbane. I got none at Sydney, though I did considerable collecting there. In the Orient, too, I found that it did not extend its range far northward. In the southern half



Distribution of Sarcophaga fuscicauda Bott.

of Japan and in China, as far north as the Yangtze River, it is by far the most abundant sarcophagid around the habitations of man. It there breeds commonly in the open tanks of human excrement. Under these conditions its maggots have acquired a habit of living in the semiliquid fertilizer. It is interesting to recall that I bred it here in 1916 under very similar conditions in liquid hen-manure.

This fly is undoubtedly an important agent in the dissemination of disease, especially those troubles that are carried in human excrement. When I was making extensive collections of the Diptera that frequented the shops where foods were exposed for sale in Yokohama, I got approximately 20 per cent belong-

ing to this species. Hence, in the adult stage, coming straight from the vilest of breeding places they contaminate candies, fruits, etc., which are commonly eaten without cooking. Children being fond of such foods are especially affected.

It is very evident that this species makes good use of the common carriers of commerce. Mr. Bryan has made an outline map to include all the records which I have been able to collect on its distribution. It will be noted that India, or southern Asia, may well be considered as the home of this species, and that in extending its range it has followed the natural routes of shipping. Inland, too, all the known locations even far removed from the coasts, lie along railways, etc. From these data the best possible guess is that these flies came to us on ships from Yokohama.

Notes on Chrysomyia Megacephala (Fabr.) (Diptera).

BY J. F. ILLINGWORTH.
(Presented at the meeting of April 2, 1925.)

As our investigations of the South Pacific Fauna progress, we find this subtropical fly more and more widely distributed. This is a marked illustration of a pest that gets about by shipping. I wish to record three new outposts.

Swezey and Wilder captured this fly at Leone, Tutuila, Samoa, September 7, 1923. Mr. Bryan, also, later found this species rather abundant on that island.

Again, during his work in the Fiji group, Mr. Bryan found these flies swarming around the odoriferous bags of dried coconut. His specimens are marked Wakaya, Fiji, November 17, 1924. Evidently the arrival of this species in Fiji is very recent. I collected there rather extensively during June, July, and August, 1913, without finding it; yet I did considerable collecting under the same sort of conditions. I took many other sorts of flies swarming over the stale, dried coconut meat.

Doctor Matsumura, Professor of Entomology in the Imperial University at Sapporo, Japan, recently gave me a male specimen of *C. megacephala* that he took with many others in the Bonin Islands. This specimen is labeled Ogasawara, August 20, 1905; determined as *Lucilia dux* Esch. As is now well known, this is a synonym of *C. megacephala.*

During my return from the Orient at the end of September, 1924, I was interested to observe how these flies take advantage of free transportation from one country to another. During sunny, warm days I found them flying about on the top deck, hovering in the vicinity of the ventilation shaft from the kitchen. Here the air was filled with the odors from the preparation of foods. During inclement weather I saw them roosting down inside on the walls of the shaft. Undoubtedly they went down into the kitchen, from time to time, to take a free lunch on the foods exposed there on the tables.

Distressing Itch from a Moth, Euproctis Flava Bremer, in the Orient.

BY J. F. ILLINGWORTH.

(Presented at the meeting of February 5, 1925)

My first experience with this moth was a rather serious one. It was during my stay at Yokohama in July, 1923. While collecting insects that flew to my lamp on the veranda, I saw a fine yellow moth circle about. In order to secure it, I had to grab it in my hand, before I could get it into the cyanide bottle. Going to bed shortly afterward, I put in a miserable night. In the morning I found that I was broken out with a rash. This was distributed in three centers: on the back of my neck; on my back, just above the hips; and on the inside of my right forearm.

My natural conclusion was that something had been biting me in the bed, yet a thorough search disclosed nothing there. Later in the day I spoke of the matter to Dr. S. Kuwana, chief of the Imperial Plant Quarantine Service. He at once told me of an outbreak of a moth which was putting whole villages out of commission. From an examination of his specimens, I at once recognized my trouble. Undoubtedly while undressing, just after I had caught the pernicious moth, I had rubbed myself, distributing the poisonous hairs to the affected areas of my skin. The itching continued for days, and it was several weeks before it entirely disappeared.

I experienced a similar outbreak of these moths in central China, at Chinkiang, near the end of August, 1924 They flew abundantly to lights and crawled into every conceivable hiding place—into bed nets, behind clothing hanging in closets, and even into one's shoes. In this way their vicious hairs became rubbed off, and wherever they came in contact with the tender parts of the skin, set up violent irritation. The native people suffered tremendously from them at that time, since none of their houses are screened. Where the moths got among their bedclothing, whole families were laid up, and worse, the virulence of the scattered hairs continued for weeks, even after all the moths had

disappeared. Every person that slept in the bed became affected. It was found that the only way to get rid of this source of infection was to thoroughly wash everything—a difficult matter with heavy padded comforters, etc., so commnnly used over there.

Briefly reviewing the literature, mostly Japanese, some of which I had translated for me, I found that this moth was a well-recognized pest among the common people of the countryside. In this connection Mills[6] says:

"Reports of injuries by the malignant influence of flying insects are quite common in the Orient. In Korea a wide variety of skin lesions and ulcerative processes are popularly ascribed to insects whose exact nature no one seems to be able to describe. Sharp bodies from the wings rather than stings or bites are usually alleged to be the cause."

As to the source of the stinging hairs there appears to be a considerable difference of opinion among the Japanese writers; also in regard as to whether the injury is a mechanical or a chemical irritation.

Mayekawa,[5] who did careful investigation on these moths from various parts of Japan, found that the body is covered with both scales and hairs. He says that mixed in with the regular scales, though the number is comparatively small, are very minute needle-like hairs. These have the tip divided into three, and the lower end near the axis sharply pointed. Their general structure is practically identical with those found on the caterpillars. Since the female covers the egg cluster with hairs from her body, the tiny poisonous hairs were commonly found in such situations. This author concludes that the irritation is mainly due to the mechanical action of the barbed hairs.

On the other hand, that the action is chemical is maintained by Sato and Koike,[7] who believe it to be an acid, since alkalies partly, but not completely neutralize it. Furthermore, Mills[6] states that the possibility of the presence of a toxin in the fresh hairs is suggested by:

a. Constitutional symptoms in the more severe cases.

b. Marked decrease in irritating properties in hairs after prolonged desiccation.

c. Presence of a patent canal throughout the length of the hairs.

d. Demonstration of dried material within the canals, which was not affected by solvents used.

Though the moth is undoubtedly the main distributor of the poisonous hairs, there is still some question as to whether they are produced by the moth or derived from the shed skin of the caterpillar in the cocoon. Gilmer [1] in his recent most comprehensive paper dealing with the poison apparatus of lepidopterous caterpillars has demonstrated that the poison is the product of a special gland cell. The gland is invariably unicellular no matter what the type of the penetrating organ. Speaking of the moths, however, he says: "In no case have poisonous properties been definitely identified as being inherent in the adult form. A number of species, all belonging to the genus *Euproctis* Hubner, or its near allies, have had the adult reported as urticating . . . : in the case of *E. chrysorrhea* the urtication is due to larval hairs spun into the cocoon, and removed therefrom by the anal tuft of the adult as it emerges through the cocoon walls. All evidence points to a like origin in other reported cases, since the hairs have the morphological characteristics of the larval hairs in every case."

AN ANNOTATED LIST OF THE PAPERS CONSULTED.

1. Gilmer, Paul M.: A comparative study of the poison apparatus of certain lepidopterous larvae. Ann. Ent. Soc. America, Vol. 18, No. 2, pp. 203-39, 21 figs., June, 1925.

2. Hashimoto, T., and Hagiwara, H.: The poisonous moth, *Euproctis flava* Bremer, and the dermatitis caused by it. Japan. Zeitschr. Dermat. and Urol., Vol. 22, No. 6, pp. 475-91, Tokyo, June, 1922. [Japanese text.] Abstract, Review of Applied Entomology, Ser. B., Vol. 11, p. 4. Records serious epidemics of acute dermatitis caused by the hairs of this moth.

3. Ito, T., and Matsusaki, H.: Ueber eine art von Dermatitis durch nachtschmetterling. Journ. Dermat. and Urol., Vol. 17, No. 4, pp. 60-61, April, 1917. [Japanese text.] Abstract in China Medical Journal, Vol. 31, No. 6, p. 521, November, 1917. This is apparently the first record in Oriental literature of dermatitis caused by the hairs of a moth. Yet, as Mills has pointed out in the above extract, there is a popular belief that many skin troubles thus originate.

4. Koike, S.: The caterpillar (probably *Euproctis flava* Bremer) caus-

ing urticarial dermatitis in Kwan San. Gunidan Zasshi (Journ. Military Surgeons, Japan), No. 76, April 30, 1918, pp. 206-10, 1 pl. Abstract in China Medical Journal, Shanghai, XXXV, No. 2, pp. 177-8, March, 1921; also, Review of Applied Entomology, Ser. B., Vol. 9, p. 118. Records outbreak among Japanese troops on maneuvers. [Japanese text.]

5. Mayekawa, S.: On "Dokuga" or *Euproctis flava* Bremer. Insect World, Vol. 20, No. 228, August, 1916. From a study of the variations of this widely spread moth the author concludes that *Euproctis (Aroa) subflava* Bremer, and *E. (Artoxa) intensa* Butler are synonyms of the above species. This paper gives a comprehensive survey of the pest, historical data, life history, character of injury, treatment, and control. [Japanese text.]

6. Mills, Ralph G.: Observations on a series of cases of dermatitis caused by a Liparid moth (*Euproctis flava* Bremer). China Medical Journal, Vol. 38, No. 5, pp. 351-71, May, 1923. Abstract in Review of Applied Entomology, Ser. B., Vol. 11, p. 151. This paper deals with the medical viewpoint. It gives a historical review and full bibliography. The reviewer uses the name *Nygmia (Euproctis) flava* F.

7. Sato, K., and Koike, S.: Dermatitis caused by the moth *Euproctis flava*. Journ. Dermat. and Urol., Vol. 17, No. 3, p. 59, March, 1918. [Japanese text.] Abstract, China Medical Journal, Vol. 35, No. 1, p. 74, January, 1921. "Poison in needle-shaped hairs, grouped at tip of tail."

8. Tanaka, Kenzo: Notes on life history and biology of *Euproctis flava* Bremer. MS.

Some Observations on the "Silverfish" (Lepisma Saccharina L.) (Thys.).

BY HELENE MORITA,
University of Hawaii.

(Presented by D. L. Crawford at the meeting of May 7, 1925.)

DISTRIBUTION.

The silverfish occurs commonly in North America, Europe, China, Japan, and the Hawaiian Islands. Like most household insects, it is well-nigh cosmopolitan in its distribution.

HAUNTS, HABITS, FOOD, AND INJURY.

The silverfish are found in great numbers in a closet or trunk containing books, magazines, newspapers, or pamphlets which have been left undisturbed for some time. Here they cause much damage by eating the paste and glue from the bindings. They are also found in the wall paper where they feed upon the paste on the back and cause it to loosen. They are found in muslin curtains, linens, starched collars, cuffs, laces and other articles of clothing containing starch, and make holes in them. Silk garments and tapestry have also been damaged, the material in this case being destroyed, apparently not so much for itself as for the stiffening it contained. Silverfish are also not infrequently found around pantries where they infest dry, starchy foods. They have been known, too, to feed upon carpets, furs, leather and the like.

It is found in dark places, always avoiding the light. The rapidity with which it runs and the slipperiness of its body, due to the scales that cover it, make it almost impossible to catch the silverfish without crushing or damaging it.

Response to Light.—Twelve silverfish were put in a box, half of which was covered with glass, and the other with cardboard. It was observed that all of the silverfish almost always kept away from the side through which light could enter. They also ran away rapidly when objects on which they were at work were brought to the light.

Descriptions of New Species of the Dipterous Family Ephydridae from Hawaii.

BY E. T. CRESSON, JR.
The Academy of Natural Sciences of Philadelphia.

(Presented by E. H. Bryan, Jr., at the meeting of September 3, 1925.)

Scatella terryi n. sp.

The general brownish olive, opaque color, the dearth of mesonotal setulae, and the absence of the whitish spot in the marginal cell, will separate this species from all others known from Hawaii.

Black with halteres yellow. Opaque, brownish olive-green; notopleura, metanotum and abdomen more grayish; face brown. Frons entirely unicolorous or orbits slightly lighter in color. Wings infuscated, with five whitish spots, none in marginal cell; mesonotal setulae sparse; bristles distinct; dorso-centrals, 1:2; acrostichals, 1:0. Fore femora with few long post-flexor bristles.

Length, 2.5 mm.

Type. Male; Wawamalu Beach near Koko Crater, Oahu, December 12, 1922 (E. H. Bryan, Jr.). [Bishop Museum collection.]

Scatella sexnotata n. sp.

This species is distinguished by its general opaque appearance, the well-developed bristles and setulae, and the infuscated wings having six whitish spots, including one in the marginal cell.

Black; halteres yellow and tarsi brown. Subopaque; mesofrontal shining; ocellar tubercle, frontalia and parafrontal almost opaque, greenish-brown pollinose; face opaque, brownish, ochreous; cheeks and lower occiput more greenish. Mesonotum subopaque, brownish, becoming more greenish anteriorly; pleura opaque brownish-cinereous below and on metanotum; scutellum shining, sparsely brown pollinose. Abdomen subopaque, brownish, with apical half of segments more grayish. Legs sparsely brownish. Wings infuscated with six whitish spots, including one in marginal cell at tip of first vein.

All bristles and setulae strong; mesonotum with dorso-centrals 1:2-3 and acrostichals 1:1 with some setulae posteriorly. Fore femora with a post-flexor series of about eight unusually strong bristles, their length more than twice the diameter of femora.

Length, 3 to 3.5 mm.

Type. Male; Waimanalo, Oahu, July 11, 1907 (F. W. Terry)

[Bishop Museum collection.] Paratypes. Six males, three females with same data. [This species has been referred to as *Scatella hawaiiensis* var. *sexnotata*, a manuscript name given to it by Mr. Terry. The type series is from Terry's original material. The species is widespread throughout the group, especially in the lowlands and lower forest. It occurs on Necker, Nihoa, Laysan, and probably other islands to the northwest of Kauai.—E. H. B., Jr.]

Scatella warreni n. sp.

This species has the general appearance of *S. hawaiiensis* Grimshaw, but averages larger, with the setulae more developed and the wings almost immaculate.

Black with halteres yellow. Mesofrontal and mesonotum more or less shining, sparsely brownish pollinose. The general polliniferous vesture is dark brown except on the pleura which is more olivaceous, becoming more grayish below. Abdomen does not show banding. Wings iridescent, rather elongate, almost clear hyaline, with at most faint indication of the usual whitish spots in the submarginal, first posterior and discal cells; veins not undulating at the spots. Face as in *S. sexnotata*, but more prominent in profile and entirely dark brown pollinose. Bristles as in *S. sexnotata*, but less interspersed with setulae on mesonotum, and the large post-acrostichal pair not distinct. The post-flexor bristles of fore femora are less uniform, but the longest are as in *sexnotata*.

Length, 3-3.5 mm.

Type. Male; Haipuaena, Maui, June 25, 1920 (E. H. Bryan, Jr.). [Bishop Museum collection.] Paratypes. One male, six females with same data. [To this species belong specimens collected October 26, 1913, by Mr. Alfred Warren in Honolulu, and discussed in these proceedings, Vol. III, p. 25, as *Ilythea* sp. Other specimens have been collected from the lowlands of Oahu and Maui.—E. H. B., Jr.]

Scatella bryani n. sp.

In this species we have the general appearance of *S. hawaiiensis*, but with the wings of *S. sexnotata*.

Small (2 mm.), black species with halteres yellow. Upper surface shining, sparsely brown pollinose; pleura faintly grayish. Dorso-centrals 1:2, acrostichals 1:0. Fore femora with a few long post-flexor bristles; wings as in *S. sexnotata*.

Type. Male; Awaawapuhi, Kauai, June 16, 1922 (E. H.

Bryan, Jr.). [Bishop Museum collection.] [Also collected about pools of stagnant rainwater near the Bishop Museum, mouth of Kalihi Valley, Honolulu, February 12, 1923.—E. H. B., Jr.]

Brachydeutera hebes n. sp.

This species has much the appearance of *B. argentata*, but is considerably larger; the head much longer with the mouth broader, very gaping and the anterior margin high, in profile; the proclinate ocellar bristles far in advance of the anterior ocellus, and the antennae more widely separated.

Black; palpi, base of halteres, middle and hind femora, tawny; wings hyaline with black veins. Opaque, with abdomen and legs more or less shining. Upper surfaces head and thorax greenish with brown markings and stripes; face, pleura, and venter of abdomen silvery to bluish.

Large species; head longer than high; proclinate bristles far in advance of anterior ocellus, about midway to anterior frontal margin; antennae separated by more than width of third antennal segment; mouth very large, one-third width of head, in profile with anterior margin above center line of eyes.

Length, 4 mm.

Type. Male; Kalihi, Oahu, February, 1923, at stagnant rainwater (E. H. Bryan, Jr.). [Bishop Museum collection.] Paratypes. Five females with same data. [This species has been known locally as *B. argentata* (Walker). It is well distributed throughout lower elevations on Hawaii, Maui, Molokai, and Oahu.—E. H. B., Jr.]

Procanace nigroviridis n. sp.

The bare, uniformly colored frons, without pre-ocellars, distinct dorsocentrals, and the entirely black color with metallic olive-green upper surfaces, are the distinguishing characteristics of this species. The uniform surface of the frons without marked mesofrontal plate, or setulae except along the extreme orbits, or pre-ocellars, and with well-developed dorsocentrals, indicate its position in *Procanace*, as based on its genotype, *P. grisescens* Handel.

Entirely black, including halteres and legs; wings slightly obscure, immaculate, opaque; frons, mesonotum and scutellum overcast with metallic olive-green pollen; face variable, reflecting blue to green or brown, depending upon the aspect; dorsum of abdomen bluish; pleura brown, becoming more grayish below; legs brownish. Frons bare except orbital bristles and hairs; face slightly more prominent between antennae than in *grisescens*; a fine bristle at lower angle; cheeks one-half diameter of eye, with two bristles; clypeus large, brown; arista bare; a vertical series of setulae on

middle of mesopleura; sixth abdominal segment distinctly longer than fifth; genital segment with long pile interspersed with bristles.

Length, 2.5 mm.

Type. Male; Awaawapuhi, Kauai, June 16, 1922 (E. H. Bryan, Jr.). [Bishop Museum collection.]

Ephydrid Fly New to Hawaii.

BY E. H. BRYAN, JR.

(Presented at the meeting of September 3, 1925.)

Canace nudata Cresson.

Mr. Cresson has identified as belonging to this species specimens collected by me at Koko Head, Oahu, July 23, 1922; Wawamalu Beach, just east of Koko Crater, Oahu, December 17, 1922; and Wake Island, July 30, 1923. To this species also belong three specimens collected by F. W. Terry on the beach near Diamond Head, Oahu, March 26, 1911; and a series from Lisiansky Island, collected by Major C. Grant, May 19, 1923.

Additional Notes on the Insects Occurring on Mauna Kea and Mauna Loa.

BY E. H. BRYAN, JR.

(Presented at the meeting of September 3, 1925.)

The island of Hawaii presents an excellent opportunity to the entomologist to study insect life under extreme conditions. Making his headquarters at Kilauea, he may visit a xerophytic desert in Kau, luxuriant fern thickets in the Fern Forest, rich pockets in the smaller craters, native forests, or the barren lava slopes of upper Mauna Loa, 10,000 to 13,000 feet elevation, almost within a day's tramp.

In 1922 (Proc. Haw. Ent. Soc., V, p. 287) I called attention to several records of insects collected at high elevation on Mauna Loa, and recorded several species collected by W. H. Meinecke on the summit of Mauna Kea, elevation 13,825 feet. This past August I had the privilege of accompanying Mr. Meinecke to the top of Mauna Loa, and spending two days in the crater of Mokuaweoweo, about 13,000 feet elevation. Shortly afterward Mr. Meinecke again ascended Mauna Kea, capturing a number of specimens. Thus a few additional records are added to our knowledge of the insects occurring at these high elevations.

The quantity of insects occurring in such a barren place as Mokuaweoweo Crater was a great surprise. Except for a very few small moss plants tucked away in moist cracks, the crater is entirely bare of vegetation. In fact almost nothing grows above 10,000 feet, and very little above 8000. The last plants we encountered were small scrubby "puakeawe" (*Styphelia Tameiameiae*) near Red Hill. Yet flying about or resting on bare lava boulders were numbers of flies of several species, and even butterflies and micro moths. When the sun shone they were lively, but when it went behind a cloud they became sluggish, for even at noontime in August the air is chilly. They were so lively that without a net I was unable to catch all the different species seen. Pursuit was difficult over the rough lava.

The most abundant fly in the crater was *Limnophora arcuata*

Stein. Curiously enough this fly has only been known in the Islands for three years, having been first captured here in 1922. It is now widely distributed throughout the group. Mr. Swezey informs me that it is also abundant in the interior of Kauai. This small anthomyid hovers in the air, and is readily recognized by the four conspicuous dark spots on the abdomen. All the other flies captured have already been reported, but a specimen of *Agromyza pusilla* Meigen settled on my hand long enough to be recognized, and I also saw a small gnat.

Two butterflies, besides the already reported *Pontia rapae*, were captured or seen: *Vanessa cardui* Linn, and *Lycaena boetica* (Linn.). Both were in the crater, and both lively.

It was a surprise to have a specimen of the common pentatomid, *Oechalia griseus* Burm. settle on us while resting at about 13,200 feet elevation. Mr. Meinecke caught another specimen at Kalaieha, on the south slope of Mauna Kea, at some 6400 feet lower elevation.

On Mauna Kea, Mr. Meinecke caught the usual *Amblyteles koebelei* (Swezey); *Chaetogaedia monticola* (Bigot); *Simosyrphus grandicornis* (Macquart); *Sarcophaga pallinervis* Thomson; *Euxoa austalea* (Meyr.); *Scotorythra rara* (But.); *Scotorythra arurea* (Meyr.), and two other rubbed specimens of moths; and a specimen of *Plagithmysus blackburni* (Sharp) caught on Mamani (*Sophora chysophylla* Seem.); also a specimen of *Agrotiphila microreas* (Meyr.) from Ainahou, 6000 feet.

It is interesting to note that, with a few exceptions, the same species of insects are captured each time from both Mauna Kea and Mauna Loa. These species are undoubtedly blown up by the wind from lower elevations. The following is a list of the species positively recorded from these higher elevations on Hawaii:

Species Found at High Elevations on Hawaii.

Hymenoptera.

Amblyteles koebelei (Swezey), Mauna Loa, Mauna Kea.
Bassus laetatorius (Fabr.), Mauna Loa, Mauna Kea.
Echthromorpha fusco-orbitalis (Cam.), Mauna Kea.
Limnerium blackburni Cam., Mauna Loa, Mauna Kea.
Psammochares luctuosus (Cr.), Mauna Loa.

Coleoptera.

Plagithmysus blackburni (Sharp), Mauna Loa, Mauna Kea (on Mamani).
Scymnus notescens (Blackburn), Mauna Loa.

Diptera.

Simosyrphus (Xanthogramma) grandicornis (Macq.), Mauna Loa, Mauna Kea.
Frontina archippivora Williston, Mauna Loa, Mauna Kea.
Chaetogaedia monticola (Bigot), Mauna Kea.
Sarcophaga pallinervis Thomson, Mauna Loa, Mauna Kea.
Haematobia irritans (Linn.), Mauna Loa.
Limnophora arcuata Stein, Mauna Loa.
Borborus sp., Mauna Loa.
Agromyza pusilla Meigen, Mauna Loa (seen).

Hemiptera.

Oechalia griseus (Burm.), Mauna Loa.
Nysius delectus White, Mauna Loa.
Nysius coenosulus White, Mauna Loa.

Lepidoptera.

Vanessa cardui (Linn.), Mauna Loa.
Pontia rapae (Linn.), Mauna Loa, Mauna Kea.
Lycaena boetica Linn., Mauna Loa.
Euxoa austalea (Meyrick), Mauna Kea.
Scotorythra rara (Butl.), Mauna Loa, Mauna Kea.
Scotorythra aruraea Meyrick, Mauna Kea.
Eccoptocera foetorivorans (Butl.), Mauna Loa.

Odonata.

Anax junius Drury, Mauna Loa.

A New Species of Fruit-Fly Parasite from Formosa (Braconidae).

BY DAVID T. FULLAWAY.

(Presented by H. F. Willard at the meeting of December 3, 1925.)

Biosteres formosanus n. sp.

Length of body 5 mm., smooth and shining, finely clothed with silvery hairs; head and thorax ochraceous, abdomen dark amber; body really closely and finely punctate, more coarsely on the head in front of the antennae, puncturation extremely fine on the abdomen; legs and antennae concolorous, but the former in the hind tibiae and tarsi, and the latter distally from segment 2 fuscous; eyes, tips of the mandibles and sheath of the ovipositor black. Head transverse, nearly twice as wide as long, wide between the eyes, which are convex; ocelli near the middle of the vertex, arranged in an obtuse triangle and with a considerable depression next the outer face of each; distance from ocelli to eye margin more than four times that between ocelli; antennae considerably longer than the body, fairly close together at the base, further removed from the eye than from each other, the sockets deep, with elevated rim, 55-segmented, the scape and pedicel stout, the flagellum filamentous; face wider than long, convex in the middle, depressed at the sides and receding somewhat below, clypeus distinct, the fossae deep, cheeks fairly wide, mandibles stout, curved and apically toothed. Thorax robust, as wide as the head and deeper than wide, sides of the pronotum deeply sulcate, mesothoracic scutum with deep, foveolate parapsidal furrows converging to a small, longitudinal, median depression situated a little before the posterior margin, transverse prescutellar sulcus with four deep fossae, scutellum triangular, metanotum costate, propodeum convex, declivous behind, irregularly areolate, with a short median carina extending caudad from anterior margin, rather hairy, stigmata small and round, mesopleurae with deep and fossulated sulci. Abdomen ovate, somewhat compressed apically, the sides anteriorly collapsed, first and second tergites longitudinally striate and separated by a deep sulcus, the former also longitudinally bicarinate sublaterally and the sides strongly margined as well, following tergites smooth and shining, with a transverse line of fine silvery hairs close to the posterior border, ovipositor exserted and longer than the abdomen. Legs rather slender, femur fairly stout. Wings hyaline, veins fuscous, radius in anterior wing arising at about the middle of the stigma, which is lanceolate, second abscissa somewhat shorter than the first transverse cubitus.

Male smaller, 4.25 mm. long.

Described from two females and four males (type, allotype, and paratypes) reared in South Formosa from pupae of a species of *Dacus* ? infesting a wild fruit, by S. Issiki, April, 1924. Types in collection of Hawaiian Entomological Society.

Table for Distinguishing the Hawaiian Species of the Genus Dryophthorus of the Curculionidae, Cossoninae (Coleoptera).

BY O. H. SWEZEY.

(Presented at the meeting of June 4, 1925.)

While recently working over and determining the several years' accumulation of material in the Family Curculionidae at the Bishop Museum, the writer found that there was need for a table to more readily separate the seventeen known species of the genus Dryophthorus. Accordingly, the following table was produced, and is herewith presented to go on record for use in future work with the species of this genus:

1. Fourth and sixth interstices of elytra running together apically where they are confluent with the raised apical margin......... 2
   Second interstice most prominently continuous with raised apical margin; second, fourth, and sixth interstices elevated and with erect setae... 3
   Sixth interstice alone continuous with raised apical margin........ 6

2. Interstices of elytra about equally elevated; size, 3.5-4 mm..*modestus*
   Second and fourth interstices slightly more elevated than the rest; size, 2.5-3.25 mm.....................................*pusillus*
   Second, fourth, and sixth interstices conspicuously more elevated than the rest; size, 5-5.5 mm..........................*declivis*

3. Second, fourth, and sixth interstices feebly elevated, and second and fourth feebly interrupted; size, 3-3.75 mm...........*brevipennis*
   Second, fourth, and sixth interstices conspicuously unevenly raised, or interrupted by lower places; size, 3-4 mm.............*verticalis*
   Second and fourth interstices strongly interrupted.............. 4

4. First and third interstices slightly elevated; size, 4.4.75 mm....... ....*insignoides*
   First and third interstices not elevated........................ 5

5. Anterior and posterior portions of second interstice equally raised; size, 3.5-4 mm.......................................*insignis*
   Second interstice more strongly raised in posterior portion; size, 3.5 mm...*fuscescens*

6. Small sized, 2.5-3 mm.. 7
   Larger sized, 4-7 mm.. 8

7. Second and fourth interstices slightly elevated; size, 2.5-2.7 mm. .... *oahuensis*
Second and fourth interstices sharply carinate; size, 3 mm. *kauaiensis*

8. Interstices with cinereous or ashy bloom........................ 9
Interstices without cinereous or ashy bloom.......................11

9. Second and fourth interstices elevated more than others; size, 6-6.5 mm...................... ....*crassus*
Interstices about evenly elevated..............................10

10. Interstices bearing distinct minute asperities; size, 6-7.75 mm. *nesiotes*
Interstices without above asperities; size, 4-6 mm..........*squalidus*

11. Second interstice more elevated than others; size, 5-7 mm... *gravidus*
Second and fourth interstices more elevated than others; size, 4.5-6 mm.................................... *homoeorhynchus*
Interstices equally elevated....................................12

12. Interstitial punctures larger than in most species and closely set, giving interstices a knobbed (?) appearance; size, 6-6.5 mm.....*peles*
Interstitial punctures moderate in size (not unusual); size, 4-5.5 mm. .... *distinguendus*

TABLE OF ISLAND DISTRIBUTION OF THE SPECIES OF DRYOPHTHORUS IN HAWAII.

Dryophthorus	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	Host trees so far as known
squalidus Shp.		Tantalus Palolo [1]	(Common throughout Islands) Kamiloloa		Olinda [1]	Kaumana [1] Kilauea	Pipturus Koa Hau
distinguendus Perk. ..		Tantalus Niu [1] Palolo [1] Opaeula [1] Makaha [1] Manoa [1] [5] Makaleha [1]	(Common throughout Islands)			Kilauea Hakalau [1] Kaumana [1] Olaa [1]	Koa Bamboo Kukui
peles Perk.						Kilauea	
nesiotes Perk.	Mts., 4000 ft. Kokee [1]						Koa Tetraplasandra
gravidus Shp.	Milolii [1]	Tantalus	X	X	X	X	Lobelia
crassus Shp.		Tantalus Niu [1]			X Waikamoi [1]		Koa
homororhynchus Perk.	Mts., 2000-4000 ft. Kokee [1]	Lanihuli [2] Pupukea [1]			Iao Valley [1]		Dracaena
declivis Shp.		Tantalus Olympus [1] Palolo [1] Niu [1] Pacific Hts. [1]	X			X	Koa Pipturus Labordea Cibotium
modestus Shp.	Kokee [1] Nualolo [1] Milolii [1]	Tantalus Konahuanui [1] Olympus [1] Palolo [1]			X	X Waimea [1]	Koa Cibotium

	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii	Host trees so far as known
pusillus Shp.		Tantalus Konahuanui [1] Palolo [1]				Kohala [3]	Cibotium
oahuensis Perk.		Tantalus Waianae Mts.					Pipturus
kauaiensis Perk.	Mts., 4000 ft.						
insignis Shp.	Kealia [4]	Tantalus Konahuanui [1] Olympus [1] Palolo [1] Niu [1] Waiawa [1] Waiahole [1] Kaala [1] Pacific Hts.[1]	(Mountains of All Islands)				Cibotium Labordea
insignoides Perk.	X	Tantalus	?	?			
brevipennis Perk.	Mts., 4000 ft.						
fuscescens Perk.	Mts., 4000 ft.						
verticalis Perk.	Mts., 4000 ft.						

Most of the records are from the Fauna Hawaiiensis.

[1] Collected by O. H. Swezey.
[2] Collected by J. C. Bridwell.
[3] Collected by F. X. Williams.
[4] Collected by L. D. Larsen.
[5] Collected by E. M. Ehrhorn.

Butterflies of Banff, Canada, and Vicinity, Collected in July and August, 1922.

BY O. H. SWEZEY.

(Presented at the meeting of October 1, 1925.)

The collection of butterflies exhibited at this time were taken during a vacation trip to the Rocky Mountain Park in the Canadian Rockies. About four weeks were spent at Banff and vicinity during the latter half of July and the first part of August, 1922. For most of the time, headquarters was at Mr. Wheeler's camp on the lower slope of Sulphur Mountain, about half a mile from the clubhouse of the Canadian Alpine Club. One week was spent on a hiking trip following trails connecting a series of camps maintained by Mr. A. O. Wheeler on what was called the Walking Tour to Mount Assiniboine. On this tour two trips were conducted weekly during the summer, going up the Spray River Valley to the Assiniboine camp near Mount Assiniboine, then following the Continental Divide some distance, returning via Golden Valley and Healy Creek, about seventy-five miles for the circuit. There were nine in the party that we went with, some riding ponies if they cared to; but, in walking, I had time to make the camps at the times scheduled and opportunities to collect butterflies and other insects along the way. One whole day was spent at the Assiniboine camp at an elevation of about 8000 feet.

The nomenclature used in this list is that of the Check-List of the *Lepidoptera* of Boreal America by Barnes and McDunnough, 1917.

PIERIDAE.

Eurymus meadi elis Stkr., 1 specimen, Assiniboine.

Eurymus eurytheme Bdv., 10 specimens, Banff; 2 Sundance Canyon.

Eurymus nastes Bdv., 1 specimen, Assiniboine.

SATYRIDAE.

Cercyonis oetus charon Edw., 7 Specimens, Banff.

Oeneis chryxus ivallda Mead., 1 specimen, Banff; 2 Spray River; 1 Healy Creek.

Erebia epipsodea Butl., 6 specimens, Spray River.

NYMPHALIDAE.

Argynnis coronis Behr., 2 specimens, Banff.

Argynnis eurynome Edw., 3 specimens, Stony Squaw Mountain; 3 Healy Creek.

Brenthis chariclea Schneid., 1 specimen, Banff; 3 Assiniboine; 2 Golden Valley; 3 Spray River.

Brenthis bellona Fabr., 1 specimen, Spray River; 1 Healy Creek.

Euphydryas nubigena beani (Skin.), 2 specimens, Spray River; 2 Assiniboine.

Euphydryas anicia (Dbldy. and Hew.), 1 specimen, Sulphur Mountain; 1 Stony Squaw Mountain; 3 Spray River.

Melitaea palla (Bdv.), 1 specimen, Golden Valley.

Phyciodes tharos Dru., 2 specimens, Banff; 1 Spray River; 1 Stony Squaw Mountain; 1 Sundance Canyon.

Phyciodes camillus Edw., 3 specimens, Banff; 1 Spray River; 1 Golden Valley; 3 Healy Creek.

Aglais californica Bdv., 1 specimen, Banff.

Basilarchia lorquini Bdv., 1 specimen, Banff; 1 Lynn Canyon, B. C.; 1 Capilano Canyon, B. C.

LYCAENIDAE.

Heodes mariposa Reak., 1 specimen, Spray River; 1 Golden Valley; 5 Sundance Canyon; 1 Lake Louise.

Plebius melissa Edw., 3 specimens, Banff; 6 Spray River; 4 Golden Valley; 5 Healy Creek; 14 Sundance Canyon; 1 Lake Louise.

Glaucopsyche xerces antiacis Bdv., 3 specimens, Spray River; 1 Healy Creek.

HESPERIIDAE.

Thanaos juvenalis Fab. (?), 1 specimen, Healy Creek. (Too much worn for positive determination.)

Pamphila comma manitoba Scud., 1 specimen, Banff; 4 Spray River; 1 Sulphur Mountain.

Kilauea Moths

BY O. H. SWEZEY.

(Presented at the meeting of November 5, 1925.)

The moths of this list were collected in August, 1925, by Mr. W. M. Giffard at lights on the lanai of his bungalow in the forest at Twenty-nine Miles, Kilauea, Hawaii. There are fifty species in the list.

NOCTUIDAE.

1 *Eriopygodes euclidias* (Meyr.).
4 *Cirphis unipuncta* (Haw.).
1 *Cirphis macrosaris* (Meyr.).
3 *Lycophotia margaritosa* (Haw.).
1 *Agrotis ypsilon* Rott.
1 *Agrotis crinigera* (Butl.).
1 *Agrotis selenias* Meyr.
4 *Hypenodes epichalca* Meyr.
1 *Hypenodes altivolans* (Butl.)
2 *Nesamiptis obsoleta* (Butl.)
3 *Plusia biloba* Steph.
10 *Plusia chalcites* Esp.
1 *Plusia pterylota* Meyr.
1 *Plusia giffardi* Sw.

HYDRIOMENIDAE.

22 *Eucymatoge monticolans* (Butl.)
2 *Hydriomena aphoristis* Meyr.
1 *Hydriomena giffardi* Sw.
3 *Hydriomena roseata* Sw.

SELIDOSEMIDAE.

2 *Scotorythra aruraea* Meyr.
3 *Scotorythra rara* (Butl.).
6 *Scotorythra hyparcha* Meyr.

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PYRAUSTIDAE.

23 *Omiodes accepta* (Butl.).
2 *Omiodes scotaea* (Hamp.).
5 *Phlyctaenia synastra* Meyr.
1 *Phlyctaenia eucrena* (Meyr.).
4 *Phlyctaenia metasema* Meyr.
1 *Phylctaenia stellata* (Butl.).
1 *Phlyctaenia endopyra* Meyr.
2 *Phlyctaenia pyranthes* Meyr.
1 *Pyrausta chloropis* Meyr.
6 *Mestolobes amethystias* Meyr.
3 *Mestolobes xanthoscia* Meyr.
2 *Mestolobes minuscula* (Butl.).
7 *Mestolobes ochrias* Meyr.
62 *Orthomecyna metalycia* Meyr.
2 *Scoparia balinopis* Meyr.
3 *Scoparia crataea* Meyr.
2 *Scoparia ianthes* Meyr.
5 *Scoparia marmarias* Meyr.
3 *Scoparia pyrseutis* Meyr.
2 *Scoparia thyellopis* Meyr.
7 *Scoparia melichlora* Meyr.
10 *Scoparia meristis* Meyr.

PTEROPHORIDAE.

10 *Platyptilia fuscicornis* Z.

HYPONOMEUTIDAE.

4 *Hyperdasys cryptogamiellus* Walsm.

CARPOSINIDAE.

1 *Heterocrossa gemmata* Walsm.
1 *Heterocrossa* sp.

TORTRICIDAE.

1 *Archips subsenescens* Walsm.
5 *Amorbia emigratella* Busck.

TINEIDAE.

10 *Heiroxestis omoscopa* Meyr.

Mango Weevil—Correction of Name (Col.).

BY O. H. SWEZEY.

(Presented at the meeting of November 5, 1925.)

In a list of common names of insects in the June, 1925, issue of the "Journal of Economic Entomology," the name used for the mango seed weevil is *Sternochestus mangifera* Fab. I noted that this generic name was spelled differently than what we had been using in the "Proceedings of the Hawaiian Entomological Society" of late years. We were using *Sternochaetus*. I wondered which was the correct spelling, so looked it up in generic lists, or at least tried to. I failed utterly in finding either of these names in any of the published lists of genera, or in recent volumes of the Zoological Record. Being at a loss as to how to account for having used *Sternochaetus* instead of *Cryptorrhynchus* in the "Proceedings" since 1920, not remembering where we had found the name *Sternochaetus*, I wrote to Dr. Guy A. K. Marshall in regard to this name.

In Doctor Marshall's reply, recently received, he said that *Sternochaetus* had been used for a short time in "The Review of Applied Entomology," on the strength of information from Dwight Pierce in a letter, who had used it and considered it a good name of Kolbe's. Doctor Marshall further says: "Having occasion to describe a *Cryptorrhynchus* I looked into the matter, and I have entirely failed to find any publication of this name. Moreover, I cannot find any grounds as yet for Pierce's view that *mangiferae* F. is generically separable from the genotype of *Cryptorrhynchus*, namely, *C. lapathi* L. I should, therefore, recommend you to use the name *Cryptorrhynchus mangiferae* for your insect."

So, I consider the matter settled, and we will drop *Sternochaetus*, and go back to *Cryptorrhynchus* which we had been using up to 1920.

Arrenophagus Albipes Girault in Hawaii (Hym.).

BY O. H. SWEZEY.

(Presented at the meeting of December 3, 1925.)

This little scale parasite of the family Encyrtidae was probably one of the early ones introduced by Koebele at the time when for many of his introductions complete records were not made. It was described by Girault * from slide mounts in the United States National Museum, labeled as follows: "1389. *Chionaspis eugeniae* Mask. On female scales, Hong Kong, China, Koebele." "Parasite of orange scurvy scale from Kiomachi, Gifu, Japan (Nawa), January 30, 1899." "1407. *Diaspis brasiliensis.* On fern, Jamsui. A. Koebele."

The first record of its occurrence in Hawaii is a note by Timberlake in Proc. Haw. Ent. Soc., V, p. 33, 1922. Here it is recorded under the name *Arrenophagus chionaspidis* Aurivillius, from specimens reared by Ehrhorn from male scales of *Phenacaspis eugeniae*, collected at Kahala (by oversight spelled Kohala in the note), Oahu, October 23, 1921. The note intimates that, although it had not been previously collected, it had probably been present for many years, as Ehrhorn had observed exit holes of a parasite in the male scales of *Phenacaspis* at various times since his arrival in Honolulu in 1909.

In Proc. Haw. Ent. Soc., V, p. 433, 1924, Timberlake corrects the name given in the previous note, using *albipes* instead of *chionaspidis*, and remarking that it has since been found commonly in Honolulu, and was taken at Kahuku, Oahu, November 8, 1923, by Pemberton.

In pruning oleander on November 11, I found an infestation of *Phenacaspis eugeniae*, and on examining closely a few infested leaves, I noticed several tiny parasites moving about among the scales. On mounting some of them, they prove to be the species under discussion. They were very abundant on the few leaves examined, half a dozen or more per leaf. When the scales were examined closely a large proportion of them were found to be

Proc. Haw. Ent. Soc., VI, No. 2, July, 1926.

* Journal N. Y. Ent. Soc., XIII, p. 242, 1915.

parasitized. These parasitized scales were chiefly young female scales, only about half-grown or less. Some male scales were also parasitized, as has been previously reported. Three hundred and nine parasitized scales were counted on one leaf. On a later examination of the oleander tree, fifty-three of the parasites were counted on one leaf. All of which goes to show how abundant this parasite is at the present time. I have examined oleanders since in various parts of the city, and always the parasite was found on any infestation of the *Phenacaspis*. The same condition was found on a number of kukui trees also, which is another favorite host of this scale.

Casinaria Infesta (Cress.) in Hawaii (Hym.).

BY O. H. SWEZEY.

(Presented at the meeting of December 3, 1925.)

This ophionid parasite was first noticed in the Hawaiian Islands in February, 1921, when it was noted abundantly among weeds at Kaimuki, Oahu. It had probably bred on larvae of *Hymenia recurvalis* Fab., for this moth was very abundant there at the time. In August of the same year it was found in the forests of the Kokee region on Kauai. March 22, 1924, a specimen was collected among weeds along a plantation trail at Hana, Maui.*

Specimens were determined by Mr. R. A. Cushman of the United States Bureau of Entomology. The species was described from Texas, and is known to occur from Florida to Maryland and west to Kansas. It is not known how it has reached Hawaii, but probably as a natural immigrant. At least we do not know of any attempt to introduce it here. The host of this parasite in Hawaii has so far always been some species of leaf-roller caterpillar. I have reared it from caterpillars of the following species collected from their respective food-plants, dates and localities being given:

Phlyctaenia argoscelis (Meyr.), on *Rumex*, Kokee, Kauai, August 18, 1921.

Phlyctaenia ommatias Meyr., on *Dubautia*, Alakai Swamp, Kauai, August 22, 1921.

Omiodes monogona Meyr., on *Erythrina*, Palmer's Crater, Oahu, February 5, 1922.

Phlyctaenia stellata (Butl.), on *Pipturus*, Tantalus, Oahu, January 10, 1923.

Hymenia recurvalis Fab., on *Amaranth*, Kaimuki, Oahu, April 11 and 24, 1923.

Omiodes asaphombra Meyr., on *Joinvillea*, Hanamaulu, Kauai, May 13, 1923.

Proc. Haw. Ent. Soc., VI, No. 2, July, 1926.

* More recently a specimen was captured in Bermuda grass near the Haleakala ranch office at Makawao, Maui, March 4, 1926.—Editor.

Pyrausta dryadopa Meyr., on *Scaevola*, Lanipo, Oahu, June 11, 1924.

Phlyctaenia platyleuca Meyr., on *Touchardia*, Kaala, Oahu, March 1, 1925.

Phlyctaenia iocrossa Meyr., on *Cyrtandra*, Puu Kaua, Waianae Mountains, Oahu, March 21, 1926.

The host caterpillar finishes its growth before being killed by the parasite larva inside of it, and makes its cocoon for pupation (usually merely spun-together leaves serving the purpose of cocoon), then the parasite larva soon finishes its growth by consuming all of the inner parts of the caterpillar, finally breaking through the skin and making its own brown cocoon within the cocoon of its host. Issuance of the adult parasite takes place in about a week or ten days.

With the exception of *Hymenia recurvalis* above mentioned, all these host caterpillars are rather scarce. A related leaf-roller (*Omiodes blackburni*) is a bad pest on coconut leaves. It would be a good thing if *Casinaria* would take to this leaf-roller, but I have not yet reared it from this species.

Records of Hawaiian Dermaptera and Orthoptera of the Family Gryllidae.

BY MORGAN HEBARD
Philadelphia, Pa.

(Presented by E. H. Bryan, Jr., at the meeting of December 3, 1925.)

Material, secured subsequent to our studies in Hawaiian Dermaptera and Orthoptera, has recently been received from the Bernice Pauahi Bishop Museum. One species previously unknown from the Islands is represented, as well as several of the scarcer forms, in the series of 114 specimens here recorded.

DERMAPTERA.

LABIDURIDAE.

PSALINAE.

Anisolabis eteronoma (Borelli).

Waiohinu, Kau, Hawaii, VIII, 4, 1923 (W. H. Meinecke), 1 ♂, 2 ♀. Honaunau, Hawaii, VI, 22, 1922 (J. F Illingworth), 1 ♂.

Anisolabis perkinsi Burr.

Kauai, 2000 to 4000 feet, III, 1919 (J. A. Kusche), 1 ♂, 3 ♀, 2 juv. ♀. Olokele Canyon, Kauai, II, 1919 (J. A. Kusche), 1 ♀. Kaholuamano, Kauai, IV, 1920 (J. A. Kusche), 1 ♂.

Euborellia annulipes (Lucas).

Kilauea, Hawaii, VIII, 22 (B. Clarke), 1 ♀. Hawi, Hawaii, VI, 22, 1922 (M. C. Neal; near shore), 1 ♂. Hilo, Hawaii, VI, 22, 1922 (J. F. Illingworth), 1 juv. ♀. Moanalua, Oahu, IV, 9, 1922 (E. H. Bryan, Jr.), 2 ♀. Honolulu, Oahu, IX, 1923, 1 juv. Waianae Mountains, Oahu (J. F. Illingworth), 3 ♀. Mount Tantalus, Oahu, IX, 7, 1923 (S. C. Ball), 1 ♀. Nuuanu, Oahu, VIII, 27 and IX, 15, 1922 (S. Bickerton), 1 ♂, 1 ♀. Waialae Beach, Oahu, X, 16, 1922 (J. F. Illingworth), 1 ♀. Kalihi, Oahu,

VIII, 18, 1923 (O. E. Cheatam), 1 ♀. Wawamalu Beach, near Koko Crater, Oahu, XII, 17, 1922 (E. H. Bryan, Jr.), 1 ♂, 2 ♀. Koko Head, Oahu, XII, 10, 1922 (J. F. Illingworth), 3 ♂, 2 ♀. Kailua, Maui, VI, 19, 1920 (E. H. Bryan, Jr.), 1 ♀. Keanae, Maui, VII, 4, 1920 (E. H. Bryan, Jr.), 2 ♀. Kokee, Kauai, I, 1919 (J. A. Kusche), 2 ♀. Kauai, 2000 to 4000 feet, II and III, 1919 (J. A. Kusche), 2 ♂, 3 ♀, 1 juv. ♀.

Labiidae.

Labiinae.

Sphingolabis hawaiiensis (Bormans).

Hilo, Hawaii, VI, 22, 1922 (J. F. Illingworth), 2 ♂, 1 ♀. Moanalua, Oahu, IV, 9, 1922 (O. H. Swezey), 2 ♂. Waialae Iki, Oahu, III, 21, 1920 (E. H. Bryan, Jr.), 1 ♀. Honolulu, Oahu (J. F. Illingworth), 1 ♀. Honopu, Kauai, VI, 20, 1922 (E. H. Bryan, Jr.; from a dead goat), 1 ♂, 1 ♀.

Labia pilicornis (Motschulsky).

Kealakekua, Hawaii, VIII, 12, 1919 (O. H. Swezey), 1 ♀.

Labia dubronyi Hebard.

Kuliouou, Oahu, XII, 22, 1918 (O. H. Swezey), 1 ♀. Palolo, Oahu, II, 26, 1922 (O. H. Swezey; from rotten *Charpentiera*), 1 ♀. Makaleha, north slopes Mount Kaala, Oahu, I, 8, 1922 (O. H. Swezey), 1 ♂. Kaumuahona, Oahu, XI, 17, 1918 (O. H. Swezey), 3 ♀. Olokele Canyon, Kauai, II, 1919 (J. A. Kusche), 1 ♂. Halehaku, Maui, VI, 16, 1920 (E. H. Bryan, Jr.), 1 ♂.

Chelisochidae.

Chelisochinae.

Chelisoches morio (Fabricius).

Honolulu, Oahu, VI, 1919 (J. F. G. Stokes), 1 ♂, 1 ♀. Kalihi Pali, Oahu, IX, 18, 1921 (E. H. Bryan, Jr.), 1 juv. Sacred Falls, Oahu, I, 22, 1922 (E. H. Bryan, Jr.), 1 ♂. Moanalua, Oahu, X, 21, 1922 (E. H. Bryan, Jr.), 1 ♀, 3 juv.

ORTHOPTERA.

GRYLLIDAE.

TRIGONIDIINAE.

Paratrigonidium gracile Perkins.

South Kona, Hawaii, VIII, 8, 1919 (O. H. Swezey), 1 ♂, 1 ♀.

Paratrigonidium varians Perkins.

South Kona, Hawaii, VIII, 8, 1919 (O. H. Swezey), 1 ♀. Makaleha, north slopes Mount Kaala, Oahu, I, 8, 1922 (O. H. Swezey), 1 ♀. Mount Olympus, Oahu (O. H. Swezey), 1 ♂, 2 ♀. Kaumuahona, Oahu, XI, 23, 1919 (O. H. Swezey), 2 ♀. Halehaku, Maui, VI, 16 and 24, 1920 (E. H. Bryan, Jr.), 1 ♂, 1 ♀. Wailuanui, Maui, VII, 2, 1920 (E. H. Bryan, Jr.), 1 ♀.

Paratrigonidium saltator Perkins.

Lanihuli, Oahu, V, 25, 1918 and XI, 24, 1919 (O. H. Swezey), 1 ♂, 1 ♀. Waialae Iki, Oahu, III, 21, 1920 (O. H. Swezey), 1 ♀.

Paratrigonidium pacificum (Scudder).

South Kona, Hawaii, VIII, 8, 1919 (O. H. Swezey), 3 ♀. Judd Trail, Hawaii, VIII, 14, 1919 (O. H. Swezey), 1 ♀. Mount Kaala, western side, Oahu, VI, 1, 1918 (O. H. Swezey), 1 ♂. Iao Valley, Maui, VIII, 8, 1918 (O. H. Swezey), 2 ♀.

ENEOPTERINAE.

Prognathogryllus robustus Perkins.

Kaholuamano, Kauai, IV, 1920 (J. A. Kusche), 2 ♂.

Prognathogryllus alatus Brunner.

Kuliouou, Oahu, XII, 22, 1918 (O. H. Swezey), 1 juv. ♂, 1 juv. ♀.

Prognathogryllus oahuensis Perkins.

Lanihuli, Oahu, XI, 24, 1918 (O. H. Swezey), 1 ♀. Kailua, Maui, VI, 18, 1920 (E. H. Bryan, Jr.; from dead twig of Coprosma), 1 ♂.

We are satisfied that of the four species described by Perkins [1] but two are valid. Examination of the types is, however, necessary to determine whether the synonyms are referable to *alatus* or to the insect we have recognized as *oahuensis*.[2]

Mount Kaala, Oahu, II, 18, 1923 (O. H. Swezey; on *Gunnera*), 2 ♂. Mount Konahuanui, Oahu, II, 23, 1919 (O. H. Swezey), 1 ♂. Kaholuamano, Kauai, IV, 1920 (J. A. Kusche), 1 ♀. Kaiwiki, Hawaii, IX, 12, 1918 (O. H. Swezey), 2 ♂, 1 ♀.

Leptogryllus nigrolineatus Perkins.

Waialae Iki, Oahu, XII, 17, 1922 (W. H. Meinecke), 1 ♀. Kaumuahona, Oahu, XI, 17, 1918 (O. H. Swezey), 1 ♀. Manoa Valley, Oahu, X, 15, 1919 (E. H. Bryan, Jr.), 2 ♀.

The eleven specimens of *Leptogryllus* here recorded further strengthen our belief that only a few variable species can be recognized, rather than many forms, as Perkins supposed.

Myrmecophilinae.

Myrmecophila americana Saussure.

1877. *Myrmecophilus americanus* Saussure, Mel. Orth., Fasc. V, p. 461. [♀, Colombia.]

Honolulu, Oahu, Bishop Museum Building, I, 17, 1924 (O. H. Swezey and E. H. Bryan, Jr.), 1 ♂, 3 ♀. The ant host of this series is *Prenolepis longicornis* Latr.

This minute dark species, with a broad whitish transverse bar on the mesonotum, was originally described from Colombia. Later it has been reported from Pará, Brazil, and from Bombay, Khandala and Wallon, India.[3] The Asiatic series were described as *M. prenolepidis* by Wasmann, a name which has been synony-

[1] Fauna Hawaiiensis, II, p. 25 (1899).

[2] Occasional Papers, B. P. Bishop Museum, VII, p. 368 (1922).

[3] Schimmer, Zeitschr. für Wissensch. Zool., XCIII, p. 427 (1909).

mized by Schimmer. Some of the North African forms of this genus which have been described are extremely close, indicating the possibility of further synonymy.

This is the first Hawaiian record for the present minute but widespread myrmecophilous cricket.

New Species of Hawaiian Chalcid-Flies (Hymenoptera).

BY P. H. TIMBERLAKE.
Citrus Experiment Station, University of California,
Riverside, California.

(Presented by title by O. H. Swezey at the meeting of
December 3, 1925.)

The types of the following new species of chalcid-flies will be deposited in the collection of the Hawaiian Entomological Society and paratypes, where available, will be placed in the United States National Museum.

PTEROMALIDAE.

Bruchobius vagabundus n. sp.

This species differs from *B. laticeps* Ashmead and *B. colemani* Crawford by having both mandibles quadridentate, the color of head and thorax of female mainly black, the first funicle joint about as long as pedicel, the stigmal and postmarginal veins equal and about two-thirds as long as the marginal, etc. A comparison with *B. medius* Masi is hardly necessary, as that species was transferred by Masi in 1924 to *Aplastomorpha*.

Female. Head wider than thorax, moderately thick fronto-occipitally, the anterior surface moderately convex; as seen from in front not quite circular, being slightly wider than long and subtruncate at the mouth; as seen from above widest at line touching posterior margin of eyes and with the frons somewhat emarginated by the scrobal impression. Eyes small, oval, not quite twice as long as wide. Malar space about as long as width of eyes. Vertex nearly two-thirds as wide as whole head and slopingly declivous behind ocelli. Ocelli in a very obtuse angle, the posterior pair nearly as far from margin of eyes as their own distance apart. Scrobes in the form of a moderately deep groove reaching nearly to the anterior ocellus. Antennae inserted a short distance above the ocular line, the sockets small, circular and placed only a little more than their own diameter apart. Scape slender, perfectly cylindrical and not quite reaching to anterior ocellus. Pedicel as long as the first funicle joint. First ring joint very short and discoid, the second about twice as long as first, yet wider than long, the third rather large, as long as wide and somewhat more than one-third as long as the following joint. Following joints of flagellum increasing slightly in thickness to apex of first joint of club and from

there rapidly tapering to the acute apex. First funicle joint about twice as long as thick, the following joints gradually shortening, the fifth being about one-fourth longer than wide. First joint of club a little longer than preceding joint and one-fourth longer than the following joint, which is about as long as thick; apical joint of club triangular in outline and about as long as its basal width. Both mandibles quadridentate. Maxillary palpi four-jointed; first joint very slightly longer than third, the second a little longer than first and about one-third longer than wide, the fourth elongate oval and about as long as the second and third combined. Labial palpi rather stout, three-jointed; first and third joints about equal and a little longer than wide, the second very short and transverse.

Thorax robust, about one-fourth longer than wide, strongly depressed above except toward the sides, and the outline of notum as seen from the side nearly straight from pronotum to middle of scutellum and thence gently arcuate to apex of scutellum. Pronotum as wide as mesonotum, arcuate, somewhat broadened toward the sides and with the anterior margin sharp. Scutellum a little broader than long, broadly rounded at apex, depressed on disk toward base but convexly rounded toward sides and apex. Neck of propodeum short. Abdomen broadly ovate, depressed, as long as and a little broader than thorax.

Wings broad, reaching somewhat beyond apex of abdomen; marginal fringe absent; discal setae short, fine, moderately dense, sparser and finer on posterior margin of disk opposite the marginal vein and absent on base of disk to distal end of submarginal vein; costal cell with only a few setae irregularly placed and mostly on apical half. Marginal vein somewhat less than one-half as long as submarginal; stigmal and postmarginal veins equal and about three-fourths as long as marginal; stigmal vein slender at base, subovally capitate at apex and provided with a short spur.

Head and thorax finely and closely puncto-reticulate by means of distinctly raised lines, the head slightly more shiny than thorax. Reticulations finer and rounded on pronotum and mesonotum and producing a rather dull surface; similar on vertex, but gradually becoming much lengthened toward center of occiput, and somewhat coarser and longitudinally lengthened on frons and face. Lines on the face gradually becoming more and more striate and converging toward the mouth, the clypeal region having the reticulations entirely replaced by close, distinct striae. Metanotum polished. Propodeum closely puncto-reticulate much like the mesonotum but a little more shiny. Pleura with the reticulations somewhat coarser than those on notum, mostly not rounded and absent on polished triangular area just below base of hind wings and on narrow dorsal margin of mesopleura as far anteriorly as base of fore wings. Coxae more finely and delicately reticulate than body. Abdomen highly polished.

Pubescence of head and mesonotum fine, short, appressed, rather sparse but quite conspicuous on account of its glistening white color. Pubescence of flagellum and legs very fine and appressed, whitish but not conspicuous.

Sides of propodeum with a small tuft of erect, not very long, whitish hair. Abdomen almost bare.

Head and thorax black, not metallic, except on anterior surface of head, which has a slight dark greenish blue luster; the polished metanotum and abdomen very dark green with a brassy luster. Eyes black, mandibles dark castaneous. Scape and pedicel pale brownish yellow, the flagellum darker brown or more or less infuscated. Legs yellowish brown, the coxae concolorous with body, the apex of tibiae and basal half, more or less, of tarsi pale yellowish white. Tegulae rather dark brown. Wings clear hyaline, the veins yellowish.

Length of body (1.77 to 2.63) 2.37; length of head, 0.704, width of head, 0.860; thickness of head, 0.435; length of antennae (without the very short radicle joint) 1.136; width of mesoscutum, 0.730; length of fore wing, 1.563; width of fore wing, 0.762 mm.

Male. Very similar to the female in many respects. Head, relative to the thorax, a little larger than in female; antennae hardly increasing in thickness toward apex, the apex of club rounded; abdomen much smaller than in female, about one-fourth longer than wide, about two-thirds as long and not as wide as thorax, very strongly depressed and suborbicular, except that it is strongly narrowed toward the short petiole. Sculpture similar to the female, but the reticulation of mesonotum coarser, being no finer than that on frons and not producing a dull surface. Pubescence nearly the same as in the female, but less conspicuous.

Head and thorax dark green with a strong luster on anterior surface of head and on mesonotum. Abdomen testaceous yellow on basal half, bluish black above on following part except apical tergite, which, with the apical half of venter, is greenish. Antennae brownish yellow, the basal half of scape yellowish white, the last three or four joints of flagellum more or less fuscous. Legs brownish yellow, distinctly paler than in the female, but apex of tibiae and base of tarsi yellowish white as in that sex.

Length of body (1.61 to) 1.87; length of head, 0.631; width of head, 0.757; thickness of head, 0.378; length of antenna (without the short radicle joint) 0.977; width of mesoscutum, 0.662; length of fore wing, 1.323; width of fore wing, 0.664 mm.

Described from thirty-eight females and thirteen males (holotype female, allotype and paratypes) reared May 2 to 14, 1923, from a mixed infestation of *Mylabris quadrimaculatus* (Fabricius) and *M. chinensis* (Linnaeus) in pigeon peas, collected by O. H. Swezey in Honolulu; one female (paratype) in laboratory at Honolulu, April 25, 1923, and probably an escape from the above material; one female (paratype) on laboratory window, Honolulu, September 13, 1916 (Timberlake); and one female (paratype) reared from *Mylabris*, Bangalore, India, February, 1921 (Subermanian).

Pachyneuron eros Girault.

Pachyneuron eros Girault, 1917, Descr. Hym. Chalc. var. cum Observ., 5, Glendale, Md., p. 1.

This species was so briefly described by Girault that a fuller description will not be out of place. It is easily distinguished from other species of *Pachyneuron* by the transverse, smooth and shining propodeum, the smooth petiole of abdomen with a prong on each side about at the middle, and by the tridentate left mandible. There are no true carinae on the propodeum, contrary to Girault's statement, although the outer margin of the foveae simulates the appearance of a carina in certain lights.

Pachyneuron eros has been made the type of the genus *Nepachyneuron* by Girault (l. c., p. 9) on the basis of the tridentate left mandible, but I do not believe this character is valid.

Female. Head rather thin fronto-occipitally, considerably broader than long, widest a little above middle and with the cheeks strongly converging toward the mouth, the frontal surface depressed medially, the occiput concave, the temples not very wide and with the posterior angle rounded. Clypeal margin with a moderately large and deep semicircular emargination with a median tooth. Vertex a little more than one-half as wide as whole head, the ocelli forming a very obtuse angle. Thorax of usual structure, except the surface of metanotum and propodeum, as seen in profile view, is very strongly declivous and forms an angle of about 110 degrees with plane of mesonotum. Propodeum transverse and without a distinct neck at apex. Abdomen much compressed, deeper dorso-ventrally than broad, fusiform in outline as seen from above, broadest between the base and the middle and very acutely pointed at apex; petiole short and with a small prong or tooth on each side near middle, the part behind the prongs slightly wider than long, the anterior part much narrower but about as long as posterior part.

Antennae inserted very close together on middle of face, the sockets less than their own diameter apart, the scapes when in position in the scrobal depression touching each other nearly to their bases. (In most species of *Pachyneuron* the scapes in such position diverge toward their bases, as the sockets are more widely separated.) Scape slender, cylindrical, not nearly reaching to anterior ocellus; pedicel about one-half longer than wide; funicle joints about as thick as long, the first joint not ring-joint-like; club joints, except apical one, a little wider than long; flagellum moderately increasing in thickness distad. Left mandible tridentate, the right quadridentate. Maxillary palpi four-jointed, the labial palpi three-jointed.

Wings of usual shape, but rather small and hardly surpassing apex of abdomen. Discal setae moderately dense, very short and absent on area

beneath submarginal vein; marginal fringe very short and absent on apical margin. Marginal vein about twice as wide at apex as at base and a little more than twice as long as wide at apex; stigmal vein distinctly longer than the marginal, apical knob small, rounded and with a distinct prong directed toward apex of postmarginal vein; postmarginal vein somewhat longer than the stigmal.

Sculpture of the usual reticulate type and the lower part of face with converging striae. As compared with *P. virginicum* Girault, the reticulations are finer, nearly uniform in size and not distinctly coarser on middle of mesoscutum as in that species. Portion of pleura behind the oblique, strong angulation reaching from base of tegulae to anterior margin of base of middle coxae, reticulate on the antero-inferior half but entirely smooth on remaining part. Hind coxae, propodeum, petiole and gaster of abdomen smooth and polished. Propodeum with two pairs of foveae on each side of the middle, the basal pair rather close to the spiracular sulcus, the apical pair much closer together. Area enclosed by the foveae delicately reticulate but shiny; the area on each side between foveae and spiracular sulcus polished; the area exterior to the spiracular sulcus very minutely sculptured and not quite as shiny as rest of propodeum.

Pubescence nearly obsolete, except for a short fringe of whitish hairs on sides of propodeum, short, fine setae on sides of apical part of abdomen, and the usual minute setae on legs and antennae.

Body shining black, with a more or less bluish tint but without any metallic luster, except slightly on pleura and more distinctly on abdomen. Scape brownish yellow, pedicel shining dark brown, the flagellum dull fuscous with grayish pubescence. Front and middle coxae and femora brownish fuscous, the hind coxae and femora similar but with a purplish blue luster; apex of all the femora narrowly, base and apex of tibiae and the tarsi except apical joint yellowish white; front tibiae otherwise yellowish or pale brown, the middle tibiae and the hind tibiae, except narrowly at base and broadly at apex, brownish fuscous. Wings hyaline; marginal vein and knob of stigmal vein fuscous, the remainder of venation paler.

Length of body, 1.52 (to 1.99); length of head, 0.474; width of head, 0.556; width of mesoscutum, 0.478; length of antenna (without the short radicle joint) 0.577; length of fore wing, 1.035; width of fore wing, 0.530 mm.

Redescribed from the following material: two females reared from puparia of *Leucopis nigricornis* Egger, Honolulu, Oahu, August, 1919 (H. T. Osborn); one female reared from same host at Honolulu, September 14, 1919 (Timberlake); two females reared from material of *Lecanium corni* Bouché, San Gabriel Canyon, California, July 13 to 20, 1911 (Timberlake); two females reared by the writer from material of *Pseudococcus auri-*

lanatus (Maskell), Santa Ana, California, October 25, 1911 (Roy K. Bishop); one female, San Diego, California, October, 1914 (C. P. Clausen); one female reared from material of *Pseudococcus adenostomae* Ferris, collected near San Diego, California, September 10, 1920 (Ferris); one female reared from *Leucopis bella* Loew, Riverside, California, August 4, 1924 (H. Compere); and one female reared from *Leucopis* sp. on *Aphis atriplicis* Linnaeus, Salt Lake City, Utah, September 1, 1914 (Timberlake). I do not have much doubt that the parasites reared from coccid material really issued from *Leucopis* puparia, as *Leucopis* is known to have been present in the material handled by the writer.

One specimen from Honolulu differs from the other specimens in having the mandibles with only two and three teeth, the labial palpi with only two joints and the parapsidal furrows less evident.

Encyrtidae.

Aphycus terryi Fullaway.

Mercet has shown (Eos, Rev. Esp. Ent. 1, p. 15-18, March 30, 1925) that *Aphycus terryi* is congeneric with *A. apicalis* (Dalman), hence the genus *Pseudococcobius* falls as a synonym of *Aphycus*.

Metaphycus alberti (Howard) and **Metaphycus claviger** (Timberlake).

These two species belong, I believe, to the group *Euaphycus* Mercet, which Mercet has recently elevated to generic standing. I am, however, skeptical of the validity of *Euaphycus* and prefer to group the species of *Euaphycus* and *Metaphycus* under the latter name.

Aphelinidae.

Prospaltella bicolor n. sp. Figure 1.

Easily distinguished from most described species of *Prospaltella* by the piceous color and yellowish white scutellum. In Girault's table of Australian *Coccophagus* (1915) it runs to *P. clariscutellum* (Girault), from which it differs by having only the scutellum yellowish white and the wings without a cross band.

It differs from *P. peruviana* Rust by the piceous instead of brownish yellow color, the wings almost uniformly and faintly tinted with fuscous, etc.

Female. Head broader than long, rather thin fronto-occipitally, well rounded on sides and below, more transverse above, and distinctly less broad than the thorax. Vertex rather more than one-third the total width of head. Antennae of ordinary length. Scape slender, a little fusiform, the radicle comprising a little more than one-fourth the total length, the scape proper about as wide as the third funicle joint. Pedicel about twice as long as thick and about equal to the second or third funicle joint. First funicle joint much shorter than pedicel or following joints and just barely longer than wide; next two funicle joints subequal, but increasing slightly in width distad, each somewhat less than twice as long as the first. Club slightly wider than funicle, the first joint barely shorter than the second, the third distinctly the longest and tapering to a rather acute point. Flagellum as a whole a little fusiformly swollen and widest at second joint of club. Thorax of normal structure, the scutellum much broader than long, broadly rounded on apical margin and slightly rounded on basal margin. Abdomen nearly as long as thorax, subovate and rather broadly rounded at apex. Ovipositor a little protruded, sometimes protruded nearly one-fifth the length of abdomen, its prominence apparently depending on various degrees of shrinkage. Fore wings moderately narrow; very narrow and of nearly uniform width to end of submarginal vein, then gradually widening, about equally on each side, to end of venation, and from there to apex widening distinctly more on costal side of disk; the apex evenly rounded. Discal setae very distinct, of a moderate degree of sparsity, becoming slightly denser near base of marginal vein and nearly absent on narrow area of disk below submarginal vein. Marginal fringe short, the longest setae not more than one-sixth the width of disk. Marginal and submarginal veins about equal, stigmal vein longer than in most species, appearing at low magnification almost as a direct continuation of the marginal, nearly as wide as marginal for a little more than half its length, tapering much on apical part and recurved toward costal margin. Hind wings nearly as in Masi's figure of *P. berlesei* (Howard), but with the discal setae a little sparser.

Thorax moderately shiny, the mesoscutum distinctly but very finely reticulate, the scutellum indistinctly reticulate; abdomen smooth and very shiny. Eyes rather densely covered with short, erect setae. Vertex and mesoscutum with only a few setae, those on the scutum being rather coarse. Scutellum provided with two pair of fine, moderately long setae. Apex of ovipositor sheaths with a ring of very fine, short, spreading setae.

Body piceous, or slightly brownish piceous in part, the scutellum pale yellowish white. Antennae, legs and mesosternum rather pale yellow, the flagellum a little dusky, and the hind femora sometimes slightly infuscated toward base. Wings almost clear, being very slightly and almost

uniformly tinted with fuscous; veins pale fuscous, except submarginal which is nearly colorless.

Length of body (0.517 to 0.591) 0.555; length of antenna, 0.461; length of scape, 0.154; length of pedicel, 0.050; length of first joint of flagellum, 0.028; length of fore wing, 0.631; width of fore wing, 0.262; length of marginal fringe of fore wing, 0.041 mm.

Described from eighteen females (holotype and paratypes) reared from *Aspidiotus cydoniae* Comstock, on sugar-cane, Honolulu, Oahu, March 17 to April 1, 1924 (Swezey); one female (paratype) collected in Honolulu, December, 1908 (Doctor Perkins); one female (paratype) reared January 19, 1916, from coccid material on *Straussia*, Tantalus, Oahu (Timberlake); and one female (paratype) collected from *Dubautia*, Mount Kaala, Oahu, May 18, 1920 (Timberlake).

P. bicolor is very similar in size and coloration to another Hawaiian aphelinid, *Pseudopteroptrix imitatrix* Fullaway, but the latter species has marginal fringe longer, the stigmal vein without a long beak, the tarsi four-jointed, etc.

Prospaltella transvena n. sp. Figure 2.

In Mercet's key to *Prospaltella* (1912) and in Doctor Howard's key (1908) *transvena* runs to *P. maculata* (Howard), but is decidedly different from that species in coloration and in many other ways. In Girault's key of Australian species (1915) it comes very near *P. sophia* (Girault and Dodd), but the second funicle joint is distinctly, although not very much, longer than the first funicle joint or the pedicel. Other species of *Prospaltella* that are entirely, or almost entirely, yellow are *P. lahorensis* Howard, *P. leucaspidis* Mercet, *P. lutea* Masi, and *P. clara* (Dodd), but *transvena* is different from these in antennal and wing characters.

Female. Head about as wide as thorax, thin fronto-occipitally, much broader than long, the outline strongly rounded and with the cheeks converging in a broad curve to the mouth. Eyes rather small, protuberant. Vertex nearly one-half the total width of head. Antennae about as long as thorax and abdomen combined, slender, nearly filiform but with the club slightly wider than the funicle. Scape about as long as pedicel and first two funicle joints combined, cylindrical and a little swollen at middle of the scape proper, the radicle joint about one-third the total length. Pedicel about twice as long as thick, as long as first funicle joint and considerably wider than any of the funicle joints. Funicle joints much

longer than wide, the middle one longest and nearly thrice as long as wide, the first joint slightly shorter than the third and nearly two and one-half times as long as wide. Club a little longer than the funicle, the middle joint a little the longest and widest and nearly twice as long as wide, the other two fully twice as long as wide and the apical one gradually tapering to a rounded point. All joints of flagellum, except first funicle joint, provided with fine linear sensoria running the whole length, or almost, of the joints, there being about one on each of the last two funicle joints and two or three on each joint of club. Thorax practically as in *P. bicolor*. Abdomen as long as thorax, rather rounded at apex and with the ovipositor slightly protruded. As in many other small species of *Prospaltella* and *Encarsia*, both thorax and abdomen are fully as deep dorso-ventrally as broad.

Fore wings rather narrow, perfectly straight along costal margin from a point about one-fourth the length of wing from its apex to the proximal end of marginal vein, which meets the submarginal in a very obtuse angle; posterior margin of wing nearly straight from the base to a point opposite apex of marginal vein and then gently curving to the rounded apex of disk. Discal setae, as compared with *P. bicolor*, very fine and rather dense, but comparatively inconspicuous, and absent on area beneath submarginal vein; submarginal row of discal setae distinctly longer than the rest, especially on the posterior margin of disk just beyond the crease. Marginal fringe one-third as long as width of disk. Marginal vein slightly longer than the submarginal and provided with about seven bristle-like setae in addition to two smaller setae at base. Apical truncation of marginal vein variable but generally more or less square. Stigmal vein short and wide, a little wider than marginal vein and nearly a half longer than width of marginal at its apex; shaped like a bird's head, with a short beak, the outer margin slightly curving toward costal margin at apex and forming a more or less gradual curve at base with apex of marginal vein. Hind wings extremely narrow and very acute at apex, being considerably narrower than in *P. berlesei* (Howard); discal setae very sparse and forming hardly more than one longitudinal row; marginal fringe not very long, yet distinctly longer than width of disk.

No sculpture discernible under high magnification. Vertex and mesonotum provided with sparse fine setae. Collar of pronotum with a row of fine setae, one of which on each side is considerably enlarged. Setae of mesoscutum arranged more or less distinctly in three transverse series, the third series composed of two long, bristle-like setae near the posterior margin. Scutellum provided as usual with two pairs of long, bristle-like setae.

Head, thorax and abdomen orange yellow, without any fuscous markings, the sternum, venter, legs and antennae much paler yellow, the antennae becoming slightly dusky at apex. Eyes dark red, the ocelli carmine. Wings perfectly clear, the veins pale yellowish, the discal and marginal setae very pale or nearly colorless.

Length of body (0.364 to 0.704) 0.589; length of antennae, 0.483; length of scape, 0.134; length of pedicel, 0.042; length of second funicle joint, 0.055, length of entire funicle, 0.145; length of entire club, 0.160; length of fore wing, 0.589; width of fore wing, 0.223; length of marginal fringe of fore wing, 0.074 mm.

Male. Similar to the female in many respects, but the antennae quite different and the coloration much duskier. Antennae, in usual slide mount, nearly as long as body. Scape slightly slenderer than in female and a little curved, the radicle joint composing about one-fourth the total length. Pedicel hardly one-half longer than thick, about one-half as long as following joint, and with fine, longitudinal, nearly parallel, or only slightly anastomosing striae. Flagellum six-jointed, filiform, without a distinctly differentiated club; first five joints nearly equal in length and width, the first somewhat more than twice as long as wide, the fifth about two and one-half times as long as wide; apical joint about one-fourth shorter than preceding joint and conically tapering to the blunt apex. Flagellum provided with prominent, longitudinal, linear sensoria extending almost the whole length of the joints, with apparently about seven on each joint, of which three to five are visible in the same focal plane, but the apical joint with only two or three altogether. Wings nearly as in female in regard to shape, length of marginal fringe, etc., but the stigmal vein considerably longer, being nearly twice as long as width of marginal vein at apex. Outer margin of stigmal vein almost straight and parallel with costal margin, the beak consequently obsolete, the base forming a gradual and more distinct curve with apex of marginal vein than in female.

Vertex and upper part of frons with distinct, transverse striations, the striae in front of median ocellus suddenly bent and convergent toward ocellus, those within the ocellar triangle triangularly disposed and with at least three running from each posterior ocellus to the median ocellus. Pronotum finely reticulate; infuscated anterior part of mesoscutum and the parapsides coarsely reticulate. Other parts of body without sculpture. Setae on vertex a little coarser than in female.

Body orange yellow, the face and under parts clear pale yellow, the center of occiput, pronotum, anterior border of mesoscutum, small blotch on parapsides, sides of propodeum and tergum of abdomen more or less infuscated, the dark parts generally being most prominent on the mesoscutum and abdomen. Scape clear yellow, the flagellum dusky yellow. Legs, including coxae, clear pale yellow. Wings hyaline, but appearing slightly darker than in female on account of the fuscous setae; margin of disk of fore wing very narrowly but distinctly infuscated on apical half; membrane of disk perceptibly infuscated at narrow part opposite apex of submarginal vein; veins slightly dusky. Eyes and ocelli as in the female.

Length of body (0.405 to) 0.828; length of antenna, 0.555; length of scape, 0.091; length of pedicel, 0.043; length of first joint of flagellum, 0.070; length of fore wing, 0.619; width of fore wing, 0.244; length of marginal fringe of fore wing, 0.072 mm.

Described from two females and one male (holotype female, allotype and paratype) reared from *Asterochiton vaporariorum* (Westwood), on tomato, Honolulu, Oahu, June 20, 1916 (Timberlake); seventeen females and two males (paratypes) reared in January and February, 1915, from *Pealius hibisci* (Kotinsky) on hau tree, Waikiki, Honolulu (Osborn); sixteen females and one male (paratypes) reared from *Pealius hibisci* on hibiscus, Honolulu, November, 1923 (Giffard); five females (paratypes) swept from grass at Pearl Harbor Peninsula, Oahu, July 4, 1919 (Swezey); two females (paratypes) on hau tree, Waikiki, Oahu, June 22, 1925 (Swezey); three males (paratypes) reared from *Aphis sacchari* Zehntner on sugar-cane, Honolulu, February 27 to 28, 1925 (Swezey); one male (paratype) reared from *Pealius hibisci* on hibiscus, Hilo, Hawaii, January, 1918 (Timberlake); and one male (paratype) reared from coccid material on coffee, but presumably from an aleyrodid, Kona, Hawaii, December, 1915 (Pemberton).

There are also specimens in the United States National Museum reared by Koebele from an aleyrodid on coffee at Olaa, Hawaii, in December, 1898; and specimens in Mr. Swezey's collection reared at Honolulu from *Asterochiton sonchi* (Kotinsky) on *Sonchus*. It is the species No. 80 and 82 of my list of chalcid-flies of the Hawaiian Islands, which prove to be the same on careful study.

Aphytis chrysomphali (Mercet).

A study of Hawaiian specimens of *A. limonus* (Rust) and Californian specimens of *A. quaylei* (Rust) convinces me that it will be necessary to consider both species synonyms of the earlier described *A. chrysomphali* (Mercet).

Coccophagus hawaiiensis n. sp. Figure 3.

Coccophagus hawaiiensis W. G. Wait, 1893, Planters' Monthly, 12, p. 562 (no description).

Coccophagus hawaiiensis Riley and Howard, 1894, Insect Life, 6, p. 334 (no description).

Coccophagus lecanii Ashmead, 1901 (not Fitch), Fauna Hawaiiensis, 1, p. 328 (excluding description).

This species is closely allied to *C. lecanii* (Fitch) and to

C. japonicus Compere. The characters separating the three species may, perhaps, be more easily understood by means of the following table:

1. Middle legs not entirely pale 2
   Middle legs, except a greater part of coxae, pale yellow; coxae, except apex of middle and hind pair, and hind femora, except at base and apex, piceous, the front femora and tibiae sometimes more or less dusky; antennae, including scape, piceous.
   japonicus Compere

2. Scape fuscous or piceous, the flagellum brownish yellow, coxae, except extreme apex of middle and hind pair, and femora, except more or less at base or apex, pale yellow, the hind tibiae more or less fuscous on basal third, remainder of legs, except apical joint of tarsi and slight infuscation on front tibiae, pale yellow.
   lecanii (Fitch)

   Scape dusky yellowish, the flagellum piceous, middle and hind coxae and hind tibiae yellowish white, the front coxae and front femora, middle femora and tibiae in large part and hind femora, except the basal third, more or less brownish or fuscous; antennae longer, the first funicle joint more than twice as long as wide.
   hawaiiensis n. sp.

Female. Of the form and structure of *C. lecanii* (Fitch), but slightly more robust and apparently a little larger. Scape slender, subfusiformly cylindrical and somewhat longer than the two following joints combined. Pedicel about one-half longer than thick and a little more than one-half as long as the following joint. Funicle joints all longer than wide, the first one longest, about one-third longer than the third joint and rather more than twice as long as wide, the third joint somewhat more than one-third longer than wide. Club about as long as the last two funicle joints and one-third of the first combined, the basal joint about as long as the preceding joint and a little wider, the next two joints subequal in length and a little shorter than the basal joint, the third joint conically tapering to the blunt apex. Joints of the flagellum provided with fine longitudinal sensoria, most numerous on the club. Thorax about one-sixth longer than wide and having the usual structure. Wings similar to *C. lecanii*, but the marginal vein rather longer than submarginal, the postmarginal vein almost as long as the stigmal, and the stigmal vein about twice as long as wide, tapering into a rather long apical process or beak and the outer margin almost parallel with the costal margin. (In *lecanii* the stigmal vein is nearly equilaterally triangular, or hardly longer than wide and without a distinct apical prolongation. In *japonicus* the stigmal vein is similar to *hawaiiensis*, but less elongate and less nearly parallel with the wing margin). Disk of fore wing with a small roundish bare spot

near posterior margin a little beyond a point opposite base of marginal vein.

Sculpture and pubescence practically as in *lecanii*, the scutellum having three pairs of discal setae, of which the pair close to apical margin is much the largest. Eyes rather more densely and conspicuously pubescent than in *lecanii*.

Body black and rather shiny on thorax and abdomen, the thorax beneath somewhat brownish; scutellum except basal third, and the very narrow metanotum, yellow. Scape dusky yellowish, the pedicel and flagellum piceous. (In *lecanii* the flagellum is paler and more yellowish than the scape). Legs pale yellow or yellowish white, the front coxae, front femora, although paler at apex, middle femora, except narrowly at base, middle tibiae, although more dilutely toward base, and hind femora, except basal third, more or less brownish or fuscous. Wings hyaline and very faintly tinged with fuscous; veins yellowish.

Length of body (0.92 to) 1.15; width of mesoscutum, 0.469; length of thorax, 0.550; length of antenna, 0.738; length of scape, 0.200; length of pedicel, 0.064; length of first funicle joint, 0.164; length of club, 0.194; length of fore wing, 0.981; width of fore wing, 0.457 mm.

Described from nine females (holotype and paratypes) reared from *Saissetia nigra* Nietner, Honolulu, Oahu (Doctor Perkins). The derm of the host is hardly blackened by the parasite.

EULOPHIDAE, TETRASTICHINAE.

Melittobiopsis new genus.

Melittobiopsis differs from *Melittobia* Westwood by having only two funicle joints and by having the male similar to the female. It differs from *Thripoctenus* Crawford by having a long conical prothorax, no postmarginal vein, the submarginal not greatly shorter than the marginal vein, the marginal fringe of wings rather short, the antennae shorter and much stouter, with the club distinctly three-jointed in the female, the mandible large and with seven teeth diminishing in size inwardly, the parapsidal furrows complete and distinct, the scutellum much broader than long and much shorter and smaller than the mesoscutum. It differs from *Winnemana* Crawford by having no grooves on the scutellum, the prothorax conical, the antennae seven-jointed, without a distinct ring joint, the stigmal vein only about one-fifth as long as the marginal, and the propodeum without a median carina.

Type of genus: *Melittobiopsis ereunetiphila* n. sp.

Female. Head strongly depressed, somewhat longer than wide, well rounded at each end and less rounded at the sides. Eyes narrow, elongate, about three-fourths as long as head and not quite reaching to posterior margin. Space between eyes very broad, occupying almost all of the dorsal surface of head, and considerably sunken in after death. Medially there is a fold or soft-walled groove, forking anteriorly near middle of head and reaching from the anterior ocellus to each antennal socket. Antennal socket situated about one-third the width of head apart in front of ocular line and rather close to clypeal margin. Antennae short, not very much longer than the head, rather strongly clavate, and composed of seven joints, not counting the well-developed pseudanellus with a distinct capitulum. Scape rather stoutly fusiform and considerably longer than the pedicel and funicle joints combined. Pedicel large, more than twice as long as wide, about one-third as long as scape and a little longer than the funicle joints combined. Funicle two jointed, the first joint distinctly wider than long, the second considerably larger than the first and only slightly wider than long. Club large, ovate, rounded at base and rather pointed at apex, much wider than funicle and nearly as long as pedicel and funicle combined, and distinctly three-jointed, with the first two joints wider than long. Second funicle joint and joints of club provided with well separated, linear, longitudinal, corneous sensoria, of which about 2, 2, 4, and 3 are visible in one focal plane on the respective joints beginning with the second joint of funicle. Mandibles rather large, provided with two relatively large outer teeth and five short blunt teeth on the oblique inner margin. Palpi extremely short, the maxillary pair two-jointed, the labial pair one-jointed.

General form moderately slender and strongly depressed. Thorax fully twice as long as wide and almost as wide as head. Prothorax conical and almost as long as the mesoscutum. Mesonotum without grooved lines, but the parapsidal furrows of scutum well developed and complete. Scutellum nearly twice as broad as long and roundingly subtruncate at apex. Propodeum without a median carina, transverse, a little shorter medially than at the sides, the posterior margin bisinuate; spiracles minute and circular. Abdomen relatively large, slightly longer than head and thorax combined and wider than thorax, broadest beyond the middle, sessile at base, and composed of seven nearly equal segments. Ovipositor not protruded, inserted nearly at the middle of the venter, the spicula stout, ensiform and slightly curved on inner margin.

Fore wings narrow, moderately long and reaching a little beyond the apex of abdomen. Marginal fringe about as long as one-fourth of the width of disk; discal setae short and moderately dense, but becoming nearly absent on area beneath submarginal vein. Venation reaching well beyond the middle of costal margin, but not nearly to apex; submarginal vein about three-fourths as long as marginal; postmarginal vein absent; stigmal vein about one-fifth as long as marginal, not much enlarged at apex but provided with a distinct spur or uncus which is directed obliquely

OBITUARY.

ALBERT KOEBELE.

(Presented at the meeting of March 5, 1925.)

Whereas, The Hawaiian Entomological Society has learned with deep regret of the death on December 28, 1924, of Mr. Albert Koebele, an honorary member of the society since its organization in 1904; be it therefore

Resolved, That the society hereby place on record its high appreciation of his notable work as pioneer in Economic Entomology in Hawaii, and the invaluable services he has rendered in the discovery and introduction of natural enemies to many of the destructive insect pests of the gardens and crops of this country; be it further

Resolved, That this resolution be spread on the minutes of the society together with the accompanying biographical sketch, and that a copy be transmitted with the sympathy of the society to the bereaved widow, and a copy be also sent to the trustees of the Hawaiian Sugar Planters' Association.

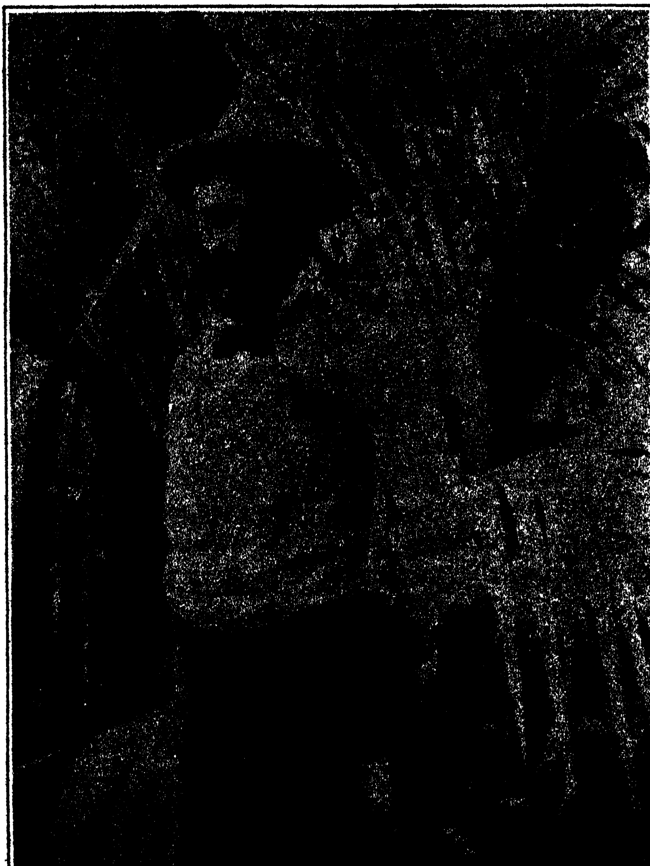
OTTO H. SWEZEY
W. M. GIFFARD
FREDK. MUIR
Committee.

BIOGRAPHICAL SKETCH.

Mr. Albert Koebele was one of the first, if not the very first entomologist, to engage in the introduction of natural enemies as a method of combating insect pests. His early work in this line was in California, where he introduced from Australia in 1888-9 the lady beetle *Novius cardinalis* as an enemy to the cottony cushion scale, *Icerya purchasi*, a serious citrus pest. This was a remarkable success, and was considered to have saved the citrus industry from ruin. His work in Hawaii commenced in 1893. Between that date and 1900 he traveled extensively in search of beneficial insects for introduction to Hawaii, visiting Australia, Fiji, Japan, China, Ceylon, Mexico, and California. Many valuable lady beetles were secured, as well as parasites for scale insects and other pests. Many of these introductions were successful, and some of the fruit and garden pests were brought into subjection.

In 1902 the lantana insects were introduced from Mexico. There were eight species of these which became established and are effective, each in its own way, in checking seed production in lantana. In 1904, with Doctor Perkins, the enemies of the sugar-cane leafhopper were studied in Australia and the egg-parasite introduced, which greatly checked the leafhopper pest and enormously lessened the annual loss from the cane leafhopper. 1905 to 1907 were spent in Fiji, California, Arizona, and Mexico, studying sugar-cane insects and their parasites, enemies of horn-fly, and miscellaneous pests. A number of minor introductions were made. 1908 to 1910 were spent in Germany, giving a chance for recovery of his health, which had been impaired by so much time spent in exploration and research work in fever-infested regions of the tropics. At the same time he studied enemies of horn-fly, and sent over much material, but little if any success was attained by this.

During the earlier part of the time in Hawaii, Mr. Koebele was employed by the Territory; but the latter part he was on the entomological staff of the Experiment Station, Hawaiian Sugar Planters' Association. In 1910, on account of his failing health, he was relieved from active duty, but retained as Consulting Entomologist. He continued in Germany and was there



ALBERT KOEBELE

Enlargement from a snapshot taken in a Honolulu garden about 1900. (Courtesy of W. M. Giffard.)

during the Great War, on account of which he was reduced to very meager circumstances, and both he and his wife suffered great hardships. At the close of the war, as soon as it was learned of their circumstances, attempts were made by the Hawaiian Sugar Planters' Association to arrange for their return to their former home in Alameda, California, but by the time all arrangements were completed he had become too feeble for undertaking such a trip.

Mr. Koebele's death occurred December 28, 1924, in Germany where he went a few years before the Great War, and was engaged for a time in studying dipterous parasites, a number of which were sent to Honolulu in the hope that they might become established and be of some assistance against the horn-fly.

The services rendered by Mr. Koebele and the benefits derived by the agricultural and horticultural interests of Hawaii by his introduction of beneficial insects cannot be estimated in dollars and cents. He made the beginning in this line of work, and much of the time was working alone, yet seventeen species of lady beetles were successfully introduced by him and have become valuable factors in keeping reduced such pests as scale insects, mealybugs, plant lice and leaf mites. At least six other lady beetles were introduced and became established, but after a few years disappeared. The eight lantana insects were introduced by him, and about the same number of miscellaneous parasites of Diptera and Lepidoptera, etc. Following Mr. Koebele in this line of work, the other entomologists have introduced a larger number of beneficial insects, and some of them have produced more spectacular and valuable results, but this should not in any way lessen the credit to be given to him who was the pioneer in Hawaii in this important branch of entomological work.

Records of Immigrant Insects for 1925

BY THE EDITOR

In this list, those marked with an asterisk were observed for the first time in 1925. The others of the list were known before, some of them having been previously recorded, but others are now recorded for the first time, or at least their full names being now used for the first time. Those with double asterisk were previously recorded, but now described for the first time.

Trigoniulus lumbricinus (Gerst.) (Myriap.) 220

Orphnaeus brevilabiatus (Newp.) (Myriap.) 221

Desmometopa m-nigrum (Zett.) (Diptera) 224

Chiromyia (Scyphella) flava (Linn.) (Diptera) 228

Chrysopa lanata Banks (Neur.) 230

* *Lepisma cincta* Oud. (Thysan.) 230

* *Lyctus planicollis* Le Conte (Col.) 232

Discomyza maculipennis (Diptera) 236

Sarcophaga plinthopyga Wd. (Diptera) 239

* Ichneumonid (Hym.) 240

Lyctus linearis (Goetze) (Col.) 241, 242

Ataenius inops Horn (Col.) 244

* *Hyposoter exiguae* (Vier.) (Hym.) 249

* *Latrodectes mactans* Fabr. (Arach.) 249

* *Stictocephalus festina* (Say) (Hom.) 249

Phloebius sp. (Col.) 250

Canace nudata Cresson (Diptera) 279

* ***Myrmecophila americana*** **Sauss. (Orth.)** 302

** *Bruchobius vagabundus* Timb. (Hym.) 305

Pachyneuron eros Gir. (Hym.) 308

** *Prospaltella bicolor* Timb. (Hym.) 310

** *Prospaltella transvena* Timb. (Hym.) 312

** *Coccophagus hawaiiensis* Timb. (Hym.) 315

** *Melittobiopsis ereunetiphila* Timb. (Hym.) 319

PROCEEDINGS

OF THE

Hawaiian Entomological Society

VOL. VI, No. 3. FOR THE YEAR 1926. OCTOBER, 1927.

JANUARY 7, 1926.

The 240th regular meeting of the Hawaiian Entomological Society was held at the Experiment Station of the Hawaiian Sugar Planters' Association at 2:30 p. m., Vice-President R. H. Van Zwaluwenburg presiding. Other members present were: Messrs. Bryan, Crawford, Ehrhorn, Fullaway, Hadden, Illingworth, Muir, Rosa, Swezey, Wilder and Williams.

The minutes of the two previous meetings were read and approved.

The Secretary reported that, at a meeting of the Executive Committee, the following appointments for 1926 had been made:

Librarian, Mr. F. C. Hadden.

Custodian of Collections, Dr. F. X. Williams.

The report of the Treasurer for 1925, which had been audited by Mr. Van Zwaluwenburg, was read and accepted.

Mr. Muir read a letter from Dr. L. O. Howard, thanking the entomologists of Hawaii for their endorsement of the plan of the Pan-Pacific Union to try to have the 1928 meeting of the International Entomological Congress held in Honolulu.

PAPERS.

Mr. Swezey presented a paper entitled **"The Sisal Borer in Hawaii,"** and exhibited larvae, pupae and adult specimens of this weevil. A discussion followed concerning the possible introduction of this species, *Scyphophorus acupunctatus* Gyll. Because of its relationship to North American species, and its distribution in Hawaii, it was the opinion of various members that

it probably came from Mexico or the southwestern United States in ornamental century plants.

NOTES AND EXHIBITIONS.

Molokai Notes.—Mr. Swezey exhibited a reared specimen of a new species of Plagithmysus reared from dead Pipturus, and gave a few brief notes on a recent field trip to the mountains of Molokai. These notes are to be included in a paper.

Thread Worms.—Mr. Swezey exhibited specimens of a thread worm (Gordius) which had been found in a six weeks old nymph of *Oxya sinensis* (Walker), our common grasshopper. Mr. Fullaway noted having found thread worms in specimens of Adoretus beetles in Formosa, and in Scotorythra caterpillars in Hawaii. Mr. Muir stated that they had been found in leaf-hoppers, and that nematodes were reported from the heads of termites.

Mites.—Dr. Illingworth reported being annoyed by the bites of a mite (*Pediculoides ventricosus* Newp.) while handling algaroba beans. A discussion followed on the prevalence of this "kiawe itch," and its relief by alcohol, kerosene and other remedies.

New Homopteron.—Mr. Muir exhibited a series of a new Homopterous insect from Haiti, related to Cixiidae.

Psammodius nanus De Geer.—Mr. Van Zwaluwenburg exhibited specimens and reported the occurrence of this small scarabaeid beetle among the roots of sugar cane in the fields of the Hawaiian Commercial and Sugar Co., on Maui. This species, which has not been previously recorded on Maui, was possibly carried there in stable manure.

Flight of Ants.—Mr. Fullaway reported a flight of *Pheidole megacephala* (Fab.) about Christmas time in Kohala, Hawaii. It had occurred after a rain, which is a favorite time for such flights.

Termites in Buildings.—Mr. Ehrhorn introduced the subject of the occurrence of termites in cement buildings in Honolulu. The discussion which followed pointed out that termites could

work their way through ordinary mortar and cracks in cement, and that the source of infestation could frequently be traced under the sidewalk to nearby telephone and electric light poles. Various ways of control were suggested, such as dipping pole butts, killing off with carbon bisulphide colonies in poles and treating the holes from which infested poles had been removed.

Froghopper from Mexico.—Mr. Van Zwaluwenburg exhibited specimens of a cercopid, *Tomaspis postica* Walker, (identified by McAtee), found abundantly in sugar cane fields in Sinaloa, Mexico, Sept. 15, 1925, by H. T. Osborn.

Immigrant Birds on Maui.—Mr. Wilder reported that the English sparrow and the linnet had become established on Maui, and were abundant even high up in Kula, on the slopes of Haleakala.

FEBRUARY 4, 1926

The 241st regular meeting of the Hawaiian Entomological Society was held at the usual time and place, with President Willard in the chair Other members present were: Messrs. Bryan, Ehrhorn, Fullaway, Illingworth, Hadden, Muir, Rosa, Swezey, Van Zwaluwenburg, Wilder and Williams

The minutes of the previous meeting were read and approved as corrected.

Mr. Hadden read a paper entitled, **"A List of Insects Eaten by the Mantis, Paratenodera sinensis** (Sauss.)."

NOTES AND EXHIBITIONS.

Anagyrus dactylopii (How.) *Established in Hawaii.*—*Mr.* Fullaway reported that this internal parasite of *Pseudococcus filamentosus* (Ckll.), which was introduced from Hong Kong October, 1925, has been recovered from material collected from the tree on which it was originally liberated.

South Pacific Insects.—Mr. Wilder exhibited part of an interesting and valuable collection of insects made by him during a trip through the Line, Society, Cook, Samoa and Fiji groups. The collection has been turned over to the Bishop Museum.

Thysanura Taken in Laboratory.—Dr. Williams exhibited specimens of silverfish captured in the Experiment Station, H. S. P. A. The specimens had been placed in a vial with paper and a little paste, where they had remained undisturbed and unattended for well over a month, and had seemed to thrive. This species was first recorded by Bridwell, Jan. 8, 1920, (see Proceedings Haw. Ent. Soc., IV, p. 453). Other specimens were taken early in 1920 by Mr. Swezey.

Termites on Lanai.—Mr. Ehrhorn exhibited specimens of *Kalotermes immigrans* and examples of their work in a twig of "naieo" (*Myoporum sandwicense*), taken on Lanai.

Azya lutipes Muls.—A specimen of this ladybeetle was exhibited by Mr. Swezey, taken by him on a Plumieria tree in front of the Grand Hotel, Wailuku, Maui, Jan. 13, 1926 Several kinds of scale insects were present, some of which were probably the food of the ladybeetle. Apparently this is the first record of this beetle on Maui.

Silaon rohweri Brid. —Mr. Swezey exhibited specimens of this tiny wasp collected by him at Lahaina, Maui, Jan. 15, 1926. They were observed flying quite abundantly among plants of *Portulaca oleracea*, a weed along the edge of the cane field. A species of Nysius bug was present on the weeds. The nymphs of this bug are the prey of the wasp, which stores them in its nest for food for the young. One of the wasps was caught by hand while alighted on a cane leaf. This is the first record of the occurrence of this wasp on Maui.

Casinaria infesta (Cress.)—Mr. Swezey reported observing this ophionid parasite quite abundant in a cane field at Lahaina, Maui, Jan. 15, 1926. Amaranths infested with *Hymenia recurvalis* (Fab.) were present and these larvae were no doubt the host of Casinaria. The only previous record of Casinaria on Maui is March 22, 1924, collected in cane field at Hana by

Mr Swezey. This parasite is now known from Kauai, Oahu and Maui.

Dryophthorus homocorhynchus Perk.—Specimens of this curculionid were exhibited by Mr. Swezey, collected by him from dead Dracaena tree in Iao Valley, Maui, Jan. 15, 1926. This species was described from Kauai, and recorded only from that island in the "Fauna Hawaiiensis." Mr. Swezey stated that he had now collected it from Kauai, Oahu and Maui, and always in Dracaena. It looks as though it was attached to this tree, instead of having general habits as most species of this genus have in Hawaii.

Pseudaphycus utilis Timb. *on Maui.*—On a recent trip to Maui Mr Swezey had kept a lookout for the avocado mealybug on guavas and avocados wherever he went. No infestations were seen anywhere on avocadoes; but a few infested guava bushes were found at two different places in Makawao. Material was brought in from these places, and in each case a few *Pseudaphycus utilis* issued. At Keanae landing the *nipae* was more in evidence on guavas than anywhere else. One of the parasites was observed on a leaf, and others issued from material brought in. This indicates the wide spread of the parasite on the island and its effectiveness.

Scotorythra paludicola (Butl.)—A series of this moth was exhibited by Mr. Swezey, illustrating the great variability of the species. He had obtained his material from near Olinda, Maui, Jan. 13 and 14, where he had investigated a defoliation of an extensive koa forest caused by the caterpillars of this moth. The series of moths had issued from larvae and pupae collected in the koa forest, the larvae from those trees which were not yet entirely defoliated, and the pupae found in and beneath moss on logs, and on the ground, also, under trash, and in the soil.

Bactra truculenta Meyr.—Mr. Swezey reported the recovery of this tortricid moth, Jan. 23, 1926, at the places where liberated in May, 1925, at the Experiment Station, H. S. P. A. A few days later several moths were collected in various parts of the station grounds, showing it to be well established. It is the nutgrass borer introduced from the Philippines.

Monocrepidius exsul Sharp *on Lanai.*—Mr. Van Zwaluwenburg reported the capture of this click beetle by Mr. Ehrhorn, January 31, 1926, on the island of Lanai. This appears to be a new locality record.

Beneficial Birds.—Mr. Ehrhorn reported that half a dozen pairs of the Willie Wagtail were being sent to Hawaii from Australia. These pretty black and white fantail birds will be liberated in Niu valley, Oahu, to prey on the horn fly. Mr. Ehrhorn also stated that the Pewees liberated in Waialae were doing well. They had been seen nesting in Araucaria trees in Nuuanu Valley.

SPECIAL MEETING, FEBRUARY 26, 1926.

"Ancestry of Insects."

BY DR. R. J. TILLYARD, NELSON, N. Z.

The entomologists of Honolulu were invited to assemble at the Experiment Station, H. S. P. A., on the afternoon of Friday, February 26th, to hear an informal discussion by Dr. R. J. Tillyard of Nelson, New Zealand, on the ancestry of the present orders of insects. The remarks were illustrated by a number of excellent specimens of fossil insects brought by Dr. Tillyard, which had been secured in the Triassic and Permian strata in Australia and Kansas.

Dr. Tillyard spoke first of the ancestry of the Homoptera, which were abundant in the Triassic and upper Permian, forms having existed even in the lower Permian. He drew on a blackboard the venation of a typical wing of an ancestor of this group, demonstrating that the stigma had been enclosed by two branches of the first radial vein, (R_1a having originated as a strut), and suggesting the nomenclature and original courses of the various veins.

Taking up the other orders in turn, Dr. Tillyard discussed the primitive forms and their early relationship.

He stated that what appeared to be the ancestors of the Heteroptera existed in the Scaetenoptera, remains of which

were found in Upper Permian strata. The wing had been divided transversely by a straight second cubital, along which the wings had frequently split. The finding in fossil beds of the two halves had led to much confusion.

He believed that he had found the ancestor of Diptera in a four winged insect in the Ipswich beds.

The ancestors of Coleoptera, Dr. Tillyard stated, had been abundant in the upper Triassic, but had not until quite recently been found in the Upper Permian They had had their point of origin near that at which the Psocids had begun. The Protocoleoptera, he explained, had originally possessed thickened wings with nine or ten main veins, between which the wings had been punctured. From these the punctate striae had evolved by the veins becoming the ridges and the punctured strips between them becoming the punctate grooves. The modern Coleoptera, however, had developed from the Protocoleoptera by many stems: the present order not being a unit, but merely held together by common characters such as the elytra. Specimens of fossil Protocoleoptera wings were exhibited, perhaps seventy million years old.

The Protohymenoptera and the ancestors of the dragonflies, Dr. Tillyard stated, had probably had a common origin in a form with a normal and rather simple venation. The present complex venation in these two orders had come about by the great development, strengthening, and persistence of numerous cross-veins.

The Order with the best record, and the oldest of the holometabolous insects (those with complete metamorphosis), were the Mecoptera. Commencing back in the Carboniferous period, and reaching a dominance in the Lower Permian of America, the fossils of these present a nearly continuous story of their development. The Order now includes only the scorpion-flies and their allies. From this line some of the other Orders have split off by specialization, such as the Neuroptera in the Upper Permian.

Dr. Tillyard concluded by stating that, while the examination of a few thousand fossil specimens had thrown some little light on the ancestry of insects, this was but the beginning. Each

new fossil discovered and studied opened up wider knowledge of the origin and relationships of this great group.

MARCH 4, 1926

The 242nd regular meeting of the Hawaiian Entomological Society was held at the usual time and place, President Willard in the chair. Other members present were: Messrs. Bryan, Ehrhorn, Fullaway, Giffard, Hadden, Illingworth, Mason and Rosa.

The minutes of the previous meeting were read and approved.

Mr. Arthur C. Mason was elected to active membership.

NOTES AND EXHIBITIONS.

Sybra alternans Wied.—Mr. Fullaway reported finding the adults of this longicorn beetle feeding on the dry limbs of a live fig tree.

Movements of Aphids.—Mr. Hadden gave some notes on a preliminary experiment to determine the speed of movement of wingless corn aphids. He had followed their movements with chalk lines on a horizontal blackboard. The aphids appeared to all be positively phototropic.

Pheidole megacephala (Fab.) *in Pineapple Fields.*—Dr. Illingworth reported this ant exceedingly numerous about the roots of pineapple plants suffering from "wilt." Observations on their feeding habits under such conditions demonstrated that they collected and ate the nematode worms, which are a most serious pest on the roots of this crop.

Prenolepis bourbonica Forel.—Dr. Illingworth stated that this ant was fairly common in the Wahiawa district in pineapple fields. On March 3, 1926, he found an exceedingly large colony in field No. 64 of the California Packing Corporation. This colony was located in the side of a bank, under paper and among the roots of very thrifty pineapple plants. Excavating to a depth of about 2 feet uncovered all stages and casts. Numerous winged males and females were present ready to fly.

A discussion followed on other ants thought to be present in pineapple fields. Dr. Illingworth stated that the larger ants had been driven out of Honolulu by *Pheidole megacephala.*

Nutgrass.—Mr. Ehrhorn exhibited photographs showing the depths to which the roots of nutgrass penetrate in the ground. The photographs showed the corms numerous two feet or more below the surface. The possibility of killing nutgrass by injecting poison gas into the ground was discussed.

Coelostoma fabriciusi Montrouzier.—Mr. Bryan stated that Dr. A. d'Orchymont was interested in Pacific Hydrophilidae and would appreciate the opportunity of looking over any specimens available. M. d'Orchymont reported in a recent letter that *Coelostoma extraneum* Sharp is the same as *Coelostoma fabriciusi* Montrouzier, from New Caledonia, which name has priority

Ophyra chalcogaster and *Ophyra nigra.*—Mr. Bryan exhibited specimens of these two anthomyid flies and read extracts from a letter from Dr. Aldrich concerning them. *Ophyra chalcogaster* Wied. is distinguished in both sexes, but especially in the male, by having white interspaces between the tarsal joints. The back of the eye at the sides forms a straight line along the middle. In the male the villosity of the hind tibia, on the flexor side, is about equally distributed between the inner and outer surfaces; and there is a trace of median stripe on the basal part of the abdomen. In *Ophyra nigra* Wied. the front tarsi do not have the white segmental portion; the margin of the eye at the side is distinctly concave in both sexes. In the male the abdomen is highly polished without basal median stripe, and the villosity of the hind tibia is mostly on the inner side. Both species occur in Hawaii, and both are widely scattered throughout the Orient.

APRIL 1, 1926.

The 243rd regular meeting of the Hawaiian Entomological Society was held at the usual time and place, President Willard in the chair. Other members present were: Messrs. Bryan,

Crawford, Ehrhorn, Fullaway, Hadden, Illingworth, Muir, Rosa, Swezey, Van Zwaluwenburg, and Williams.

The minutes of the previous meeting were read and approved as corrected.

The secretary made a report on the number and condition of the stock of "Proceedings" of the society. He also extended the offer of the Bishop Museum to house these publications. It was moved by Mr. Muir and carried that the stock of the Proceedings not needed for immediate disbursement be stored in the Bishop Museum. To this was added that the thanks of the society be conveyed to Dr. Gregory, Director of the Bishop Museum, for this kind offer.

PAPERS.

"Notes on Forest Insects of Molokai."

BY O. H. SWEZEY AND E. H. BRYAN, JR.

NOTES AND EXHIBITIONS

Archytas cirphis Curran.—Mr. Muir reported this introduced Mexican Tachinid abundant in the fields of the Hawaiian Commercial and Sugar Company, along the Kula Road at an elevation of 3,000 feet, and at Wailuku, on Maui. It had not been sent over to Maui, but must have either flown across or traveled on the inter-island shipping. It is doing good service as a parasite on armyworms in the cane fields.

Armyworms and Cutworms.—Mr. Swezey deplored the loose way in which the terms "Armyworm" and "Cutworm" were used interchangeably. In sugar cane fields one generally finds only armyworms, such as *Spodoptera mauritia* (Boisd.) and *Cirphis unipuncta* (Haw.). These climb the stalks and eat the leaves, and are numerically abundant night and day. The cutworms, on the other hand, such as *Agrotis ypsilon* Rott., *Agrotis crinigera* Butler, and even *Feltia dislocata* (Walker), are nocturnal in their feeding, rarely travel in large numbers, live at higher elevations generally, and cut off stalks at their base. Even the native Hawaiians, in a general way, distin-

guished between these caterpillars. "Peelua" was the armyworm which ate the leaves of plants; "Poko" or "Poki" was the cutworm, which buried itself in the ground.

Scolia manilae Ashm., *on Kauai.*—Dr. Illingworth reported finding this root grub parasite flying in numbers in pineapple fields at Kapaa, Kauai. About the roots of the plants were to be found the grubs of *Adoretus sinicus* Burmeister, the so-called Japanese rose beetle.

Pantala flavescens Fab.—Mr. Hadden reported seeing a mynah bird eating one of these dragonflies.

Euplectrus platyhypenae How.—Mr. Swezey reported recovering this parasite at an elevation of 4,000 feet, Waiopai, Maui, March 3rd, 1926; also at lower elevations in the same region, and at Makawao, at about 2,000 feet elevation. In all instances the host caterpillar was *Cirphis unipuncta* (Haw.). The same parasite was found by Mr. Van Zwaluwenburg at Wailuku, Olowalu and Lahaina. This indicates that the Mexican armyworm parasite is well established on Maui.

Hyperaspis silvestrii Weise.—Mr. Swezey exhibited specimens of this ladybeetle reared by him from guava leaves infested by *Pseudococcus nipae* (Mask.) collected at Makawao, Maui, near the tunnel outlet of the Wailoa Ditch, Jan. 13, 1926.

Stethorus vagans Blkb.—Mr. Swezey reported this ladybeetle at Olinda, Maui, Jan. 13, 1926. Not previously recorded from Maui.

Hemiteles tenellus (Say).—Mr. Swezey reported collecting this cryptine at Olinda, Maui, Jan. 13, 1926. Not previously recorded from Maui.

Celerio lineata (Fab.).—Mr. Swezey reported that Dr. Lyon had brought in caterpillars of this sphingid moth found feeding on *Godetia grandiflora*, at Wahiawa.

Hyposoter exiguae (Vier.).—Mr. Swezey reported *Scotorythra paratactis* Meyr. as a new host for this ophionid parasite. He had found quite a number of cocoons on Dodonaea bushes that were considerably eaten by the caterpillars of this moth in

Kawaihapai valley, Feb. 21, 1926. The caterpillars were still very numerous and a number were brought in for rearing.

Micromus vinaceus Gerst.—Mr. Swezey reported recovering this introduced Australian hemerobiid at Kawaihapai, 2,000 feet in the Waianae Mountains, Feb. 21, 1926.

Holochlora japonica Burm.—Mr. Swezey reported finding this large katydid at 2,000 feet elevation, Kawaihapai, Waianae Mountains, Feb. 21, 1926. This is the farthest from Honolulu yet reported.

Nothorestias swezeyi Muir.—A female of this delphacid leafhopper was exhibited by Mr. Swezey. It was collected by him Feb. 21, 1926, on ferns in the Waianae Mountains above Kawaihapai at an elevation of 2,000 feet. This species had been collected but once before, and that was by him, March 27, 1921, in Makaha valley at a location about two miles southeast from where the present specimen was taken.

Chaetogaedia monticola (Bigot)—A specimen of this tachinid fly was exhibited by Mr. Swezey that had been reared by Mr. Williams from a chrysalis of *Vanessa tammeamea* Esch., the caterpillar of which had been collected on the trail from Sugar Loaf hill into Hering valley. This is a new host record for this tachinid.

Tetramorium sp.*—Mr. Swezey exhibited specimens of a species of ant whose nest was found March 22, 1926, in a sugar cane stalk which had been bored by *Rhabdocnemis obscura* (Boisd.). This occurred in a field at the Manoa substation, at an elevation of 500 feet. *Tetramorium guineense* (Fab.) was also present, but this differs from it in its smaller size and several minute structural characters.

Argyroploce illepida (Butl.)—Mr. Swezey called to attention that the tortricid moth which has been known as *Cryptophlebia illepida* in the Hawaiian islands, and which is such a pest in koa seeds, has been placed in the genus Argyroploce by Meyrick. (See Records of the Indian Museum, V, p. 218, 1910.)

* Later identified by Dr. W. M. Wheeler as *Tetramorium tonganum* Mayr. [Ed.]

Meyrick states: "Calcutta, bred from litchi fruit in June and at light in August (Annandale). Having obtained a series of the Hawaiian form, I find it is identical with Australian, Indian and South African examples; the larva feeds in various fruits." Synonomy is given. This establishes this insect as an introduced form. But it was originally described from Honolulu as long ago as 1882 from specimens collected by Blackburn.

Oxya velox (Fab.)—Dr. Williams reported finding both the young and adults of this grasshopper in cane fields of the Hilo Sugar Co., mauka from Wainaku, Sept. 19, 1925. The occasional jagged injury to cane leaves could be seen. This is the first record of this insect on that island.

Dengue Fever.—Mr. Fullaway called attention to the paper on Dengue in the Philippine Journal of Science (Vol. 29, 1-2, Jan.-Feb., 1926), and to the fact that the mosquito which carries it (*Aedes aegypti* (Linn.)) occurs in Hawaii.

Conocephalus saltator (Sauss.)—Dr. Illingworth stated that he had found this grasshopper in pineapple fields eating mealy bugs, bud-moth caterpillars and the larvae of small rot flies.

MAY 6, 1926

The 244th regular meeting of the Hawaiian Entomological Society was held at the usual time and place, Vice-President Van Zwaluwenburg in the chair. Other members present were: Messrs. Bryan, Ehrhorn, Fullaway, Hadden, Illingworth, Mason, Muir, Rosa, Swezey, Wilder and Williams.

The minutes of the previous meeting were read and approved as corrected.

PAPERS.

Dr. Illingworth presented a paper entitled **"Predominance of Pheidole megacephala."** The reading of the paper was followed by a discussion of the habits of this ant, and the similar habits of the Argentine ant.

Silvanus sp.—Mr. Swezey exhibited a specimen of beetle collected behind leafsheaths of sugar cane at the Manoa substation of the Hawaiian Sugar Planters' Association, May 5, 1926. It appears to belong to the genus Silvanus, but not to any of the species listed in Leng's Catalogue of North American Coleoptera. This is apparently the first record of its occurrence here.

Cryptophagus sp.—Mr. Swezey exhibited two specimens of a cryptophagid beetle collected March 20, 1926, in Manoa. This is an undetermined immigrant species that has apparently not been collected here before.

Cryptamorpha desjardinsi (Guer.).—Dr. Illingworth exhibited an adult and larva of this cucujid beetle and read the following note: "The predacious larvae of this beetle are rather common on pineapple plants. Especially is this true where the plants and fruits are attacked by such pests as mealybugs, bud moths, fruit beetles, and other tiny larvae of flies, etc., which live within the leafsheaths and just under the fruit. I have seen the Cryptamorpha larvae feeding on such pests, and have bred out the adults. The pupation period is 6 to 7 days."

Book Preservation.—The following book solution was suggested by Dr. Illingworth to prevent the attack of silverfish, roaches and book beetles: 1 oz. corrosive sublimate (white powdered form), 1 oz. carbolic acid (crystals), dissolved in 1 quart of ethel alcohol.

Mr. Muir added that for the covers a little shellac, about 4 ozs. to a quart of solution, might be added.

Termites.—Mr. Muir called attention to the report on termites attacking poles, made by the Joint Pole Committee of the Mutual Telephone Company and the Honolulu Rapid Transit.

JUNE 3, 1926.

The 245th meeting of the Hawaiian Entomological Society was held at the usual time and place, with Vice-President Van

Zwaluwenburg in the chair. Other members present were: Messrs. Bryan, Crawford, Ehrhorn, Fullaway, Hadden, Illingworth, Muir, Rosa, Swezey, and Williams.

The minutes of the previous meeting were read and approved.

PAPERS.

Mr. Swezey presented a paper entitled, **"Hyposoter exiguae (Viereck) in Hawaii."**

NOTES AND EXHIBITIONS.

Coptotermes.—Mr. Fullaway reported an infestation of Coptotermes in lumber at Pearl Harbor Navy Yard. The lumber was, he thought, not local but imported from the coast. A line of electric light and telephone poles connects this section with Honolulu. Termites have been traced in poles as far as Pearl City.

The date of flights of termites was discussed. Flights were reported by various members as having occurred about Honolulu May 15th and 30th Termites had been seen to swarm as early as 6 p. m It was conjectured that they perhaps favored a warm, humid evening after a cold spell.

Mr. Ehrhorn and others called attention to records of Coptotermes eating living and growing Begonia plants, and live palms. Mr. Muir suggested that this might be due to the dryness, the termites leaving dead wood to seek moisture in living plants.

Insecticides.—Mr. Hadden mentioned the effectiveness of sodium fluoride as an insecticide against roaches, fleas on dogs and cats, and poultry parasites. Mr. Ehrhorn mentioned "Oronite" fly spray for fleas.

Scolia manilae Ashmead.—Dr. Illingworth reported this grub parasite abundant in fields of pineapples at Wahiawa. Grubs of *Adoretus sinicus* were present in the soil.

Archytas cirphis Curran (MS.).—Mr. Swezey reported observing this Mexican tachinid fly on flower beds in two places at Hilo, May 9, 1926. This is the first record of this fly having become established on Hawaii. It must have resulted from the

liberations made by Mr. L. W. Bryan of flies taken by him when returning to Hilo, Sept. 8, 1925, and March 16, 1926, respectively. The flies supplied him had been collected in the fields, and of the first lot he reported that six survived the trip, and of the second lot eleven survived. From this beginning they will probably spread over the whole island.

Mr. Rosa reported that in breeding Spodoptera caterpillars in the laboratory at the Experiment Station, H. S. P. A., he obtained adult Archytas flies. He explained that the caterpillars could only have been parasitized by the eggs of the fly having been carried in on grass

Euplectrus platyhypenae How.—Mr. Swezey reported finding this armyworm parasite established at six places on the Parker Ranch, Hawaii, May 11 and 12, 1926. Three places were at Waikii and three were in the vicinity of Mana—two widely separated regions. This is the first record of the parasite being established on the Parker Ranch.

Ox Warbles.—Mr. Swezey reported observing ox warbles quite common on the backs of cows at the Pookanaka Dairy of the Parker Ranch, May 12, 1926. The cows were Holsteins and were in the milking barn at the time. The first cow in the row had about a dozen of the warbles in her back, and others had fewer. On inquiry of the dairy foreman, it was learned that they were not imported cows. He had commonly noticed the warbles on young cattle. This would indicate that this cow pest is established there.

*New Immigrant Curculionid.**—Mr. Swezey exhibited specimens of a large weevil found by him hiding in tufts of grass at the Waikii and Mana sections of the Parker Ranch on Hawaii, about 4000 feet elevation, May 11 and 12, 1926. It is apparently the first discovery of this immigrant beetle. Nothing was learned of its habits. Mr. Hadden has examined it and found it to be the same species as that of which he has undetermined specimens, collected in Berkeley, California.

Plagithmysus.—Mr. Swezey exhibited a minute specimen of Plagithmysus reared from dead *Rubus Hawaiiensis* at Olinda,

* Later identified as *Listroderes apicalis* Waterhouse. [Ed.]

Maui. It is not the *Plagithmysus vitticollis* Sharp that has been associated with this shrub by Dr. Perkins. Whether it is a new species or not, is not yet determined.

Introduction of Birds—The subject of bird introduction was brought up and questions asked in a letter from Mr. C. S. Judd, Chief Forester, were discussed at some length by the members.

It was moved by Mr. Crawford, and carried, that the Hawaiian Entomological Society go on record as opposing the introduction of the downy and hairy woodpeckers.

It was further moved and carried that the society does not favor the introduction of the Peking nightingale until more definite information is received as to the purpose for which it is introduced, and concerning its habits

It was further moved and carried that the President appoint a small committee to draft a letter setting forth the reasons of the society for opposing the introduction of these birds.

The president appointed Messrs Muir, Fullaway and Bryan.

"*Insect Fauna of Samoa.*"—Mr. Swezey presented the question as to the advisability of the Bishop Museum cooperating with the British Museum in the plan of the latter to publish an "Insect Fauna of Samoa," based largely on collections made in Samoa by Drs Buxton and Hopkins. It was the opinion of the members that such cooperation would be to the advantage of the Bishop Museum for the following reasons: (1) The Samoan material in the Bishop Museum would be worked up more quickly and with less effort. (2) The resulting publication would be more complete and useful for further Pacific work. (3) Connections would be established with competent systematists. (4) Duplication of effort and synonymy in literature would be avoided. (5) Available funds and personnel could be more immediately applied to entomological exploration in other Pacific groups which had been neglected. (6) Having the disposition of its own material, and being assured of duplicate material from the Buxton and Hopkins collection, no arrangement could be fairer to the Bishop Museum.

JULY 1, 1926.

The 246th regular meeting of the Hawaiian Entomological Society was held at the usual time and place, with Vice-President Van Zwaluwenburg in the chair. Other members present were: Messrs. Bryan, Crawford, Ehrhorn, Fullaway, Hadden, Illingworth, Mason, Rosa and Williams.

The minutes of the previous meeting were read and approved.

The Secretary reported that the committee appointed at the previous meeting to reply to the letter from the Board of Agriculture and Forestry regarding the introduction of certain birds, had prepared an answer embodying the resolutions passed at the June meeting of the society, and giving reasons for the same. This letter had been signed by most of the members of the society and forwarded to Mr. C. S. Judd.

NOTES AND EXHIBITIONS.

Scolia manilae Ashmead *on Molokai.*—Dr. Illingworth reported this root grub parasite abundant in the vicinity of Mauna Loa, Molokai, where the grubs of *Adoretus sinicus* Burm. were also to be found. About 600 of this wasp were distributed to several localities on Molokai by L. T. Lyman, June and July, 1923.

Ammophorus insularis Boh.—Mr. Ehrhorn exhibited specimens of this tenebrionid beetle, which he had found in termite riddled wood at the end of pier 27, Honolulu. Although Mr. Fullaway stated that he had also found them associated with termites in Iwilei, it was thought that the beetles were only hiding in the termitarium. This species eats decaying organic material, especially vegetation and wood.

Plagithmysus pulverulentus (Mots.) *on Tantalus.*—Mr. Hadden exhibited a fine series of specimens of this longicorn beetle, and some other beetles, which he had found running about on a sickly koa tree on Tantalus.

Termite Flights.—Mr. Van Zwaluwenburg presented a list of dates on which termites, both *Coptotermes intrudens* Oshima and *Cryptotermes piceatus* Snyder, had been observed in flight.

General discussion brought forth that flights were pretty general throughout June, especially on still evenings after damp days. It was noted that five species and one variety of termites are now reported from Hawaii. The termite situation in Honolulu was discussed, including various methods of poisoning lumber, and a plan to fumigate street and railway cars.

AUGUST 5, 1926

The 247th regular meeting of the Hawaiian Entomological Society was held at the usual time and place, President Willard in the chair. Other members present were: Messrs. Bryan, Ehrhorn, Fullaway, Giffard, Hadden, Illingworth, Mason, Rosa, Van Zwaluwenburg and Williams.

The minutes of the previous meeting were read and approved as corrected.

NOTES AND EXHIBITIONS.

Termite Control.—Mr. Ehrhorn exhibited part of a mass of debris, the work of *Coptotermes intrudens* Oshima, found between two floor joists in the second story of the Royal Hawaiian Sales Co., corner of Richards and Hotel Streets, Honolulu. On August 3rd the colony had been very much alive. A pole standing on Richards Street, on the edge of the sidewalk, fully 20 feet away, was fumigated with carbon bisulphid. August 5th no sign of activity was noted in the colony. Mr. Ehrhorn stated that in other instances the fumigating of service poles near buildings has caused activity of the termites in the buildings to stop within a day or two.

Dr. Illingworth stated that the exhibited termite debris was similar to that found in riddled trees in North Queensland, where the riddling is called "piping." It is used as cheap cement for floors and tennis courts in Australia.

Henoticus serratus (Gyllenhal).—Mr. Giffard exhibited four specimens of this rare cryptophagid beetle, beaten from *Myoporum sandwicensis* and Suttonia at Kilauea, Hawaii, August, 1920. Specimens were placed in the collection of the Experiment Station, H. S. P. A.

Scotorythra hyparcha Meyrick.—Mr. Giffard reported having been informed by Roy Finch of the Hawaii Volcano Observatory that an immensely large flight of this nocturnal moth occurred at the Volcano House, Kilauea, and neighboring residences for one night only, on the evening of April 3, 1926.

A previous record (Proc. Hawaiian Ent. Soc., Vol. 5, No. 2, p. 192, September, 1923) of a similar flight in the same region reported its continuation nightly for several months.

Although the moth is quite common at Kilauea, only a few individuals are usually seen nightly, and there are at times periods of weeks when none appear at light. It would be interesting to know the cause of these periodical and unusually large flights.

Spread of Cryptotermes in Hawaii.—A note by Mr. Muir was read stating that Cryptotermes had been sent in from Hakalau and Honokaa, Hawaii, and McBryde Plantation, Kauai. Specimens had been taken at Spreckelsville, Maui. On Oahu specimens have been sent in from Waialua and Kahuku.

Ischiogonis syagrii Fullaway.—Mr. Fullaway reported that this fern weevil parasite had the weevil in control about Kilauea, Hawaii.

Mr. Giffard added that the weevil had become hard to find. He considered the parasite at least 95 per cent effective, and thought that the control would be permanent unless the biological complex were upset.

Eutreta xanthochaeta Aldrich.—Mr. Bryan reported that in a recent letter to Dr. Illingworth, Dr. J. M. Aldrich had stated that he had secured a specimen of this Trypetid, which is our lantana gall-fly, at Coban, Guatemala. This species was introduced into Hawaii from Mexico in 1902 to help check the spread of lantana. It is distinguished from *Eutreta sparsa* Wied. by its yellow bristles on the head and thorax.

Opius humilis Silvestri.—Mr. Willard reported the successful introduction of two shipments of this Mediterranean fruit-fly parasite into Bermuda. He thought that it would probably become established there.

Returning from an extensive trip to the mainland, Mr. Willard brought greetings from Dr. L. O. Howard, Dr. C. L. Marlatt, August Busck, P. H. Timberlake, and other friends of members of the society.

SEPTEMBER 2, 1926

The 248th regular meeting of the Hawaiian Entomological Society was held at the usual time and place, President Willard in the chair. Other members present were: Messrs. Bryan, Crawford, Fullaway, Giffard, Hadden, Illingworth, Mason, Muir, Rosa, Swezey, Van Zwaluwenburg, and Williams. Mr. Ashley C Browne was a visitor.

The minutes of the previous meeting were read and approved

It was moved by Mr. Fullaway and unanimously carried that the Society extend a vote of thanks to the Hawaiian Sugar Planters' Association for their continued support in the printing of the "Proceedings," and that the Secretary write a letter conveying this vote of thanks to the Trustees of the Association.

PAPERS.

Dr Illingworth exhibited specimens and presented an annotated list of the insects found in pineapple fields at Mauna Loa, Molokai.

NOTES AND EXHIBITIONS

Latrodectes mactans (Fabr.).—Mr. Hadden exhibited a specimen of this "hour glass spider," taken at Waikiki, in a garden, by James Wilder, August 29, 1926 Two specimens have been previously captured, both at Koko Head. A general discussion followed as to the extent to which this spider is poisonous

Coleotichus blackburniae White.—Mr. Hadden exhibited specimens of the eggs, larvae and adults of this showy metallic green bug, from koa on Tantalus, August 28, 1926. The young are red with black markings and the eggs creamy white.

Mediterranean Fruit Fly at Kilauea.—Mr. Giffard reported having received in June last from Mr. Roy Finch of the Volcano Observatory, a small vial containing larvae in alcohol of a fly, taken by him from ripe wild peaches in the so-called "Bird Park" at Kilauea, Hawaii. It was suspected that they might be the larvae of *Ceratitis capitata* Wied. This latter fact was confirmed by Mr. Giffard in August. During a recent trip to Kilauea (in July), he visited the peach trees in the park in company with Mr. Finch, and gathered two or three ripe specimens of the fruit which appeared to have been stung by a fruitfly. From these he bred in August the following: 11 specimens of *Ceratitis capitata* Wied., 1 specimen of a small black phorid fly, and 1 specimen of the fruitfly parasite, *Diachasma tryoni* Cameron.

It is interesting to note that not only does Ceratitis thrive in the Kilauea dry forest region at approximately 4,200 feet elevation, but that one of the parasites introduced for its control has followed it to that high elevation and isolated locality. It was thought by other members that both may have been carried there by picnickers in mangoes or avocados.

Two or three years ago at 4,000 feet elevation in the arid area to the south of the volcano, while sweeping for other insects in company with Mr. Fullaway, Mr. Giffard captured two or more specimens of *Diachasma fullawayi*, which it was then supposed had been blown to that high altitude from lower elevations in the Hilo district. Mr. Giffard now suspects that they were parasitizing larvae of the fruit fly in the fruits of Cyathodes or Ohelo (possibly both), both of which shrubs were quite common and in fruit at that time all thru the region.

Mr. Giffard had not known Ceratitis to attack the peaches in his garden at 29 miles, Olaa, (3,900 feet elevation), which is 2 miles below the Volcano but in a much more rainy region than that of the Bird Park. He believes this to be the first record of *Ceratitis capitata* Wied. having been bred from fruit in the Kilauea region.

Regarding the fruit fly at high elevations, it was stated by other members that it breeds all year round at Waimea, Hawaii, and is found as high as Waikii, 6,000 feet elevation. On Maui

none have been reported in peaches at Olinda, 4-5,000 feet, but they are bad at Kula, 3,000 feet elevation.

In reply to a question asked by Prof. Crawford regarding the Mediterranean fruitfly in papayas, Mr. Willard stated that they will sting the tree-ripened fruit, but usually not green fruit. Prof. Crawford had seen a partly-ripe papaya with a 4- or 5-day-old maggot in it.

Neoclytarlus sp.—Mr. Fullaway exhibited a specimen belonging to this genus of longicorn beetles, captured at Kilauea, Hawaii, July, 1926.

Listroderes apicalis Waterhouse.—Mr. Swezey reported having obtained this as the name for the new immigrant weevil found by him May 11-12 at Waikii and Mana on the Parker Ranch, and reported at the June meeting of the Society. Specimens had been compared by G. R. Wilson, San Francisco, Calif., with some that had been collected at San Jose and had been determined at Washington as *Listroderes obliquus* Gyll. A recent paper by Chittenden, (Proc. Biol. Soc., Washington, v. 39, pp. 71-74, July 30, 1926.), however, gives the name as above. It is known as the Australian tomato weevil in Mississippi, where it was first noted in 1922. Mr. Hadden had specimens in his collection collected on hollyhock at Berkeley, California, in 1925.

Alfalfa Weevil Control in California.—Mr. Swezey exhibited specimens of the alfalfa weevil, which had been captured by quarantine inspectors at the "Nevada line." Mr. Browne described the methods of examining traffic between Nevada and California in an effort to keep this weevil and other pests out of California. He stated that the weevil had spread rapidly throughout Colorado, Utah and Nevada, causing 30 to 40 per cent loss to the alfalfa crop. It was a wonder to him that, despite all the precautions, the weevil had not gained access to the rich fields in central California.

Tetramorium tonganum Mayr.—Specimens of this ant were exhibited by Mr. Swezey. He had found a nest of them, March 23, 1926, in a stalk of sugar cane that had been eaten by the cane borer at the Manoa substation of the Hawaiian

Sugar Planters' Association. The determination had been made by Dr. W. M. Wheeler. The ant was described from Tonga in 1870. It has more recently been recorded from Fiji and the Solomon Islands. This is its first record in the Hawaiian Islands.

Sclerognathus bacchus Hope.—Mr. Swezey exhibited specimens of this Lucanid beetle collected at Cunco, Chile, which had been sent to him by E. R. Leach of Piedmont, California. They somewhat resemble our native Lucanid, *Apterocyclus honoluluensis* Waterhouse, and may throw light on the origin of this curious species.

Entomological Meetings at Oakland.—Mr. Swezey made a brief report on the meetings of the Pacific Coast Entomological Society and the Pacific Slope Branch of the American Association of Economic Entomologists, which he attended in June at Mills College, Oakland, California. He also related some of his experiences in hiking and collecting insects in Yosemite Valley, which he visited in company with P. H. Timberlake, the last week of June.

Arsenate of Lead on Apples.—Mr. Browne, who is representing the California Spray Chemical Co., while in Hawaii on a vacation, spoke of the problems of apple and other fruit growers arising from arsenate of lead poisoning. It is frequently necessary to spray the orchards several times against coddling moth and other pests. The law permits but a hunredth of 1 per cent of poison on the fruit; and the arsenate of lead does not wash off sufficiently, nor will brushing devices remove more than half of the poison. Various other sprays are being tried.

OCTOBER 7, 1926

The 249th regular meeting of the Hawaiian Entomological Society was held at the usual time and place, President Willard in the chair. Other members present were: Messrs. Bryan, Fullaway, Hadden, Illingworth, Mason, Muir, Rosa, Swezey, Van Zwaluwenburg, and Williams.

The minutes of the previous meeting were read and approved.

PAPERS.

F. X. Williams, **"Notes on the habits of the bees and wasps of the Hawaiian Islands."**

O. H. Swezey, **"Notes on Rhyncogonus extraneus."**

E. H. Bryan, Jr., **"Stratiomyiidae from Japan, China, and Malaysia."**

O. H. Swezey, **"Foreign Sphingidae in the collection of the Experiment Station of the Hawaiian Sugar Planters' Association."**

NOTES AND EXHIBITIONS.

Cephalochrysa hovas Bigot.—Mr. Bryan exhibited specimens of this showy Stratiomyiid fly, which has been known locally as "Sargus sp." The determination was made by Mr. Brunetti, from specimens sent to the Imperial Bureau of Entomology, London. This is the third immigrant species of soldier fly known to occur on the main islands of the Hawaiian group. The other two are *Neoexaireta spinigera* (Wied.) and *Evaza javanensis* de Meij. No native species are known.

Coptotermes intrudens Oshima.—Dr. Illingworth reported finding the soil in the yard of a new residence at the corner of 15th and Maunaloa Ave., Kaimuki, infested with these termites. Considerable damage had been done to plants around its base. The stems of geraniums, coleus, etc., had been so thoroughly mined that the plants had succumbed.

Dr. Illingworth also reported finding a supplemental nest of these termites at the Oahu Ice Company's plant. This was located between the ceiling joists, and was as large as a good sized washtub. It was composed of the wood-pulp excrement of the colony, and had the appearance of a corky material. It is important to note that this nest contained numerous individuals of all stages of the colony, including both the winged royal pairs and the neoteinic forms. The latter, according to Snyder, are able to maintain the colony in a thriving condition. With this species, the main consideration is a sufficient supply of moisture. In this case, moisture was found to come both from a leaking tank on the roof, and from the dampness below.

*Spodoptera Egg Parasite.**—Mr. Rosa reported that a number of parasites had issued on October 4, from Spodoptera eggs which he had found the previous week. Mr. Swezey stated that they were a species of Telenomus as yet unrecorded from Hawaii, and not closely related to the Hawaiian species. They were not very abundant, as yet, for Spodoptera eggs had not been much parasitized.

Coptotermes intrudens Oshima *in Sugar Cane.*—Mr. Swezey reported that this termite had been found in sugar cane in a garden at Pearl City, Oahu. A discussion followed as to the means of spread of this pest. In every instance of local infestation of sugar cane by termites, a nearby stump, pole or piece of wood has been found to be also infested.

Plagithmysus solitarius Sharp.—Mr. Swezey exhibited a female and male of this cerambycid beetle, collected by Mrs. H. L. Lyon on the Pupukea-Kahuku military trail, Sept. 15, 1926. The pair well exhibit the difference in coloration of the sexes as pointed out by Dr. Sharp in the Fauna Hawaiiensis, vol. III, page 647, 1910, where the female is first described. The male is quite uniformly ferruginous, while the female has black femora and thorax. He also exhibited another specimen of the same beetle, reared by himself from a pupa found beneath the bark of an ohia ha stump, September 18, 1926, on the same trail. Old stumps and trees which were cut when the trail was made show borings of large numbers of some longicorn beetle beneath the bark. Possibly it was this same species. If so, it indicates that it can become very numerous when conditions are favorable.

Nesotocus giffardi Perkins.—Mr. Swezey exhibited a specimen of this strange native weevil, collected by him in the split base of a fallen Pterotropia tree on the Pupukea-Kahuku military trail, September 18, 1926. This extends the known range of this weevil to practically the whole length of the Koolau Range, it having been known previously from Kuliouou, near the southeast end, to Lanihuli, and at Kahana. There was no evidence

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* Later determined by Mr. A. B. Gahan of the U. S. Bureau of Entomology as *Telenomus nawai* Ashm. [Ed.]

of its breeding in the Pterotropia log. It appears to have only recently fallen, for the bark was still in good condition, and some leaves on the top were still green. Perhaps, later on, the larvae may be found here, as it is probably one of its host trees, being an araliad.

Pleurophorus parvulus Chev.—Mr. Swezey called to attention that the aphodiid beetle in our collections and recorded in the Proceedings of the Hawaiian Ent. Society, IV, p. 606, 1921, as *Psammodius nanus* De Geer, is synonomized with *Pleurophorus parvulus* Chev. in Leng's Catalogue of the Coleoptera of North America, where it is indicated that *nanus* is cited in error by Horn in Trans. American Ent. Society, XIV, p. 96, 1887.

Pachyneuron allograptae Ashmead.—Mr. Swezey reported finding a female of this parasite examining a puparium of the syrphid fly, *Simosyrphus grandicornis* (Macq.), on Sept. 24, 1926. It was placed in a vial for observation. After some time it selected a place that seemed satisfactory to it and began inserting its ovipositor. It seemed to have great difficulty, and occupied about ten minutes before the ovipositor was fully inserted. Then it remained in this position for another fifteen minutes before withdrawal. At 8 a. m. on October 6th, the parasites were found to have issued, in only twelve days from oviposition. There were fifteen females and twelve males. From six other puparia collected at about the same time as the other one, the flies themselves issued, which is unusual, as they are usually quite heavily parasitized, either by the Pachyneuron or by Diplazon.

Caterpillar Plague in Kau, Hawaii.—In reference to a caterpillar plague in Kau, Hawaii, as recently reported in the newspapers, Mr. Swezey stated that he had written to one of the plantation managers of that district requesting that some of the caterpillars be sent for determination, so as to determine whether it was a new immigrant pest or not. A few caterpillars were sent and they proved to be those of two common hawkmoths. *Celerio lineata* (Fab.) and *Herse cingulata* (Fab.). Apparently rains in the region had brought on a new growth of Portulaca

and Ipomoea, which are the favorite food plants of these species respectively. The caterpillars were very numerous over a large lowland area, extending over nearly all the region from the south point to Honuapo and to Waiohinu. Some families were said to have moved from their houses on account of the numerous caterpillars crawling in.

Ceratitis capitata Wied. *in Dates.*—Mr. Willard stated that he had reared three adults of this fruit fly from dates collected by E. M. Ehrhorn on the premises of E. D. Tenney, Pensacola and Lunalilo Sts., September 14, 1926. This is the second instance on record where the Mediterranean fruitfly has been reared from dates in Hawaii. Back and Pemberton, U. S. D. A. Bulletin No. 536, page 45, record rearing two adults from fruits of the unimproved date palm, *Phoenix dactylifera*, in August, 1913.

NOVEMBER 4, 1926.

The 250th meeting of the Hawaiian Entomological Society was held at the usual time and place, President Willard in the chair. Other members present were: Messrs. Bryan, Crawford, Ehrhorn, Giffard, Hadden, Illingworth, Mason, Muir, Rosa, Swezey, Van Zwaluwenburg, Whitney and Williams. Dr. Marie Faus was a visitor.

The minutes of the previous meeting were read and approved.

PAPERS.

Mr. Swezey presented a paper entitled, **"Life history notes on the Mexican Tachinid, Archytas cirphis."**

NOTES AND EXHIBITIONS.

Coptotermes runway.—Mr. Ehrhorn exhibited a runway of *Coptotermes intrudens* Oshima found at the University Club building, Honolulu. These runways when old are rather large, and can be used to advantage for fumigating with carbon bisul-

phid. He also exhibited two young queens from a nest found on the roof of the Inter-Island Terminal Pier, No. 26. Eggs and individuals in all stages were also found. The nest, as far as observed, did not have any connection with the soil.

Mole Cricket Parasite.—Dr. Williams exhibited an immature specimen of *Gryllotalpa africana* secured October 25, on Tantalus, Oahu, at 1,700 feet elevation, just after it had been parasitized by *Larra luzonensis.* This wasp parasite was introduced to Hawaii last year from the Philippines.

Xiphidiopsis lita Hebard *in Honolulu.*—Mr Giffard exhibited a specimen of this small, long-horned grasshopper, captured at the corner of Keeaumoku and Heulu Sts., Honolulu. The specimen was a female; the male is still unknown.

Hypoderma lineata (DeVillers).—Dr. Illingworth exhibited specimens of the maggots of this heel fly which he and Dr Marie Faus had secured from the backs of freshly killed cattle at the Kalihi slaughterhouse. The cattle had been sent over from the Parker Ranch, where they were bred. Maggots have been found in cattle in Hawaii from time to time, but no specimen fly has yet been captured. (See Hawaiian Planters' Record, XXV, p. 23, 1921; and Proceedings Hawaiian Entomological Society, Vol. VI, p. 363, 1926.)

Orneodes objurgatella Walsingham.—A good series of this delicate little plume moth was exhibited by Mr. Swezey reared by him from the fruits of *Plectronia odorata*, collected at Mahena, 1,400 feet elevation, West Maui, October 13, 1926. It had not been previously recorded from Maui, but had been reared abundantly a number of times on Oahu from the fruits of the same tree.

Ethmia colonella Walsingham.—Mr. Swezey reported capturing a specimen of this oecophorid moth at Wailuku, Maui, October 11, 1926, and also finding the caterpillars numerous on a *Cordia subcordata* tree at Kahului, October 16th. The moth has been scarce of late years due to the scarcity of the host tree. On account of the devastation by these caterpillars, the

tree has not been planted much of late years in Hawaii, and is now seldom met with. The kou tree (*Cordia subcordata* Lam.) at Kahului was in the school yard, where there were also two others, somewhat recently planted, and had grown well, but many of the leaves were ragged from the feeding of the Ethmia caterpillars.

Bruchus sp. near *coryphae*.—Mr. Swezey reported collecting this bruchid on *Ipomoea pes-caprae* at Kahului, Maui, October 16, 1926. It was so common that in some patches of the plant nearly every seed capsule had an exit hole made by the bruchid. This is the first record of its occurrence on Maui.

Engytatus geniculatus Reuter.—Mr. Swezey reported collecting this little bug on tomato vines growing wild on a ditch bank at Olowalu, Maui, October 11, 1926. It is the first record of its occurrence on Maui.

Latrodectes mactans Fabricius.—Mr. Swezey reported another capture of this poisonous "hour-glass" spider. Two of them were found while unpacking some camping cots at Laulaunui Island in the western part of Pearl Harbor, October 24, 1926, by Miss Deverill. Apparently the spider had crawled into these folded cots, stored in a cabin on the island, either for nesting, shelter or hiding. This extends the known distribution of the spider. The places where it has been collected so far are: Koko Head, Waikiki, Iwilei, Lanikai, and now Pearl Harbor. It emphasizes the fact that precautions are necessary in regard to spiders—to avoid this one.

Telenomus nawai Ashm.—Mr. Rosa exhibited a vial containing a great number of these tiny parasites. They have issued from Spodoptera eggs collected at Kaimuki and Waikiki. The life cycle of the parasite is from ten to twelve days. Colonies have already been sent to every plantation on Hawaii.

DECEMBER 2, 1926.

The 251st regular meeting of the Hawaiian Entomological Society was held at the usual time and place, President Willard in the chair. Other members present were: Messrs. Bryan, Crawford, Ehrhorn, Giffard, Hadden, Illingworth, Mason, Rosa, Swezey, Whitney and Williams.

The minutes of the previous meeting were read and approved as corrected.

The report of the Treasurer for 1926 was read.

OFFICERS ELECTED FOR 1927

President: Mr. R. H. Van Zwaluwenburg.
Vice-President: Mr. E. H. Bryan, Jr.
Secretary-Treasurer: Mr. H. F. Willard.

Members of the Executive Committee. { Mr. F. Muir. / Mr. W. M. Giffard.

The matter of a contribution to the Zoological Society of London toward the continued publishing of the Zoological Record was discussed. It was moved by Mr. Swezey, seconded and carried that a voluntary contribution from the members of the society up to the sum of twenty-five dollars ($25.00) be collected by the Secretary-Treasurer for the Zoological Record.

On motion of Mr. Giffard, the president appointed Messrs. Swezey, Giffard and Bryan as a committee to look into the advisability of amending the by-laws relative to the separation of inactive from active membership.

Mr. Willard read his Presidential Address on **"Some Observations in Hawaii on the Ecology of the Mediterranean Fruitfly, Ceratitis capitata Wied., and Its Parasites."**

Mr. Bryan presented a paper by Mr. J. R. Malloch on **"A New Species of Sapromyzidae from the Hawaiian Islands (Diptera)."**

Mr. Hadden presented a paper entitled **"Saprinus oregonensis Lec., a Correction."**

Oxya chinensis (Thunberg).—Mr. Swezey called to attention that our grasshopper under the name *Oxya velox* (Fabricius) has in recent literature been considered as *Oxya chinensis* (Thunberg). See: Willemse, Tidschrit voor Entomologie, LXVIII, pp. 3 and 49, 1925; and Uvarov, Bulletin of Entomological Research, XVII, pt. 1, p. 48, 1926.

Plagiomerus hospes Timberlake.—Mr. Swezey reported collecting a specimen of this encyrtid parasite on Mt. Kaala, Nov. 11, 1926. This is apparently the first record of it from the Waianae Mountains, the previous records being from Nuuanu Pali, Kalihi, Waimalu, and Opaeula of the Koolau Range. The habits of the parasite are not yet known.

Telenomus nawai Ashm.—Mr. Swezey reported finding this Spodoptera egg parasite on the Kamehameha School grounds, November 23, 1926. Egg clusters of *Spodoptera mauritia* (Boisd.) were quite abundant on the underside of leaves of young Ficus trees in various parts of the grounds. On several of these egg clusters the adult parasites were seen. Other clusters consisted of empty egg shells from which parasites had issued, apparently all of the eggs having been parasitized.

Mr. Swezey also reported finding a cluster of parasitized eggs of *Spodoptera mauritia* on a Ficus leaf in his yard on Lanihuli Drive, Manoa, November 29th. Apparently nearly every egg of the cluster was parasitized. Three other egg clusters from which the parasites had already issued were found on the same tree. Apparently when an egg cluster is attacked all or nearly all of the eggs are parasitized. Fifteen adult parasites were seen at another egg cluster. This extends the known distribution of this parasite from Kaimuki and Waikiki to Kapalama and Kalihi and up into Makiki and Manoa.

Milichiella sp.(?)—Mr. Swezey exhibited specimens of a fly that had appeared in large numbers recently near a large compost heap at the Experiment Station, H. S. P. A. The first ones were collected September 9, 1926. They are quite numerous in this one place. Apparently the fly has not been previously observed here.

Latrodectes mactans Fabricius.—Dr. Illingworth reported finding this "hour glass" spider in pineapple fields in the Lualualei District, below Kolekole Pass, Waianae. They were seen April 16, 1926, hiding at the base of the leaves of the pineapple plants.

New Host for Ceratitis capitata in Hawaii.—Mr. Willard reported rearing 87 specimens of this fruitfly from five fruits of Lucuma sp. which were collected October 8th, 1926, at Moanalua. This is the first record of Lucuma as the host of the Mediterranean fruitfly in Hawaii.

Termites Intercepted in Quarantine.—Mr. Whitney reported the following cases of termites intercepted at the Bureau of Plant Inspection of the Board of Agriculture and Forestry:

Coptotermes formosanus Shiraki. Inspection No 536; large colony found in a case of banana shoots and yams from Manila, P. I., consigned to U S. Agricultural Experiment Station, Honolulu, July 9, 1918.

Reticulitermes (Leucotermes) spretus Kolbe. Inspection No. 787 G; from a shipment of *Paulownia imperialis* logs from Japan, February 1, 1922.

Reticulitermes hesperus Banks. Inspection No. 1321; a small colony found in a broken lath in soil of a balled citrus tree from Cascada Ranch Nurseries, San Francisco, California, November 11, 1926. This is a western species, apparently restricted to Washington, Oregon, Nevada and California. It is reported by Snyder to be a destructive wood borer, injuring any wood in contact with the ground, including telephone poles and the woodwork of buildings.

Stratiomyiidae and Tabanidae from Japan, China and Malaysia (Diptera).

BY E. H. BRYAN, JR.

(Presented at the meeting of October 7, 1926.)

A small collection of Stratiomyiidae, sent for identification to the Imperial Bureau of Entomology, London, has been returned, with species determined by Mr. Brunetti as listed below. The specimens were collected by F. Muir unless otherwise noted:

STRATIOMYIIDAE

Ptilocera 4-dentata (Fabr.): Java, Singapore; Manorg, W. Borneo.

Ptilocera fastuosa Gerst.: Cebu, P. I. (Williams); Los Banos, P. I. (Williams).

Tinda indica (Walker): Telok Ayer, W. Borneo; Buitenzorg, Java; Makassar, Celebes; Pekalongan, Java; Hong Kong China, (Terry).

Evaza demeijerei Brunetti: Amboina; Laloki, Papua.

Eva javanensis de Meij.: Buitenzorg, Java; Amboina; Makassar, Celebes; Mowong, W. Borneo.

Negritomyia responsalis Walker: Piroe, Ceram.

Negritomyia consobrina (Bigot): Amboina; Laloki, Papua; Los Banos, P. I. (Williams).

Ephippiomyia bilineatum (Fabr.): Tjibodas, 5000′, Java, (Terry); Buitenzorg, Java; Manorg, W. Borneo.

Hermetia remittens Walker: Pontianak, Borneo.

Hermetia cerioides (Walker): Laloki, Papua; Amboina.

Eudmeta marginata (Fabr.): Borneo, Roban, Java; Soerabaia, Java, (Terry).

Stratiomyia apicalis (Walker): Kowloon.

Sargus mactans Walker: Macao, China; Pontianak, Borneo.

Sargus redhibens(?) Walker: Amboina.

Sargus splendens Brunetti: Macao, China.

Ptecticus longipennis (Wied.): Doro, Java, 800-1300'; Roban, Java.

Ptecticus tenebrifer (Walker): Okitsu, Japan.

Ptecticus melanuris (?) (Walker): How-Lik, China, (Kershaw.)

Ptecticus aurifer (Walker): How-Lik, China, (Kershaw).

Microchrysa flaviventris (Wied.): Pontinak, Borneo; Larat; Amboina; Toeal, Kei Island.

Wallacea argentifer Kert.: Amboina.

Aulana confirmata Walker: Amboina.

TABANIDAE

Chrysops dispar (Fabr.): Macao, China.

Chrysops flaviventris Macquart: Buitenzorg, Java.

Chrysops flaviventris v-nigrum deMeij.: Buitenzorg, Java.

Chrysops fixissima Walker: Telok Ayer, Borneo.

Chrysops signifer Walker: Amboina.

Chrysops japonica Wd.: Tokyo, Japan.

A New Species of Sapromyzidae from the Hawaiian Islands (Diptera).

BY J. R. MALLOCH.

(Presented by E. H. Bryan, Jr., at the meeting of December 2, 1926.)

The species described below is the only one which I have seen from the Hawaiian Islands and is probably the same which was recorded without a specific name by Grimshaw in the "Fauna Hawaiiensis."

Homoneura hawaiiensis n. sp.

Male and female.—Head testaceous, greyish dusted, interfrontalia with two dark vittae, face with a dark transverse mark below the antennae insertions, and another near lower margin, antennae and palpi testaceous. Thorax largely or entirely fuscous and densely grey dusted, margin of scutellum always testaceous. Abdomen testaceous, some or all of the tergites with a fuscous fascia which leaves a variable amount of apex and base of each pale, fifth tergite in male and fifth and sixth in female with a pair of small black spots. Legs dull testaceous. Wings clear, cross veins slightly darker than other veins. Halteres pale yellow.

Frons about 1.5 as long as wide, with short surface hairs, the orbits slightly differentiated, all bristles except the ocellars strong and long, the ocellars not half as long as anterior orbitals; arista pubescent, face slightly bulging over the impressed mouth margin; lower occipital bristles strong. Thorax with three pairs of strong dorsocentrals, the anterior pair close to suture, one pair of strong prescutellar acrostichals, six series of intradorso central hairs, and two sternopleurals. Hypopgium stout, the tergite forming its base with apical processes stout and truncate, projecting downward. Fore femur with an anteroventral comb; all tibiae with a distinct preapical dorsal bristle; hind femur with one or two preapical anteroventral bristles. Inner cross vein at middle of discal cell; penultimate section of fourth vein two-thirds as long as ultimate.

Length, 4-4.5 mm.

Type and allotype, on same mount, type male, Tantalus, Oahu (O. H. Swezey). Paratypes: two, same locality as type, and same collector; two, Honaunau, Hawaii (J. G. Stokes); two, Puna, Hawaii, (O. H. Swezey); one, Wailupe, Oahu, (O. H. Swezey); one, Waiahole, Oahu, (E. H. Bryan, Jr.); one, Palehua, Oahu, (O. H. Swezey); one, Waimalu, Oahu

(J. C. Bridwell); one, Kilohana, Kauai, (O. H. Swezey); one, Keanae, Maui, (E. H. Bryan, Jr.); one, Kapaa, Kauai, (J. A. Kusche); one, Kauai, (W. H. Ashmead). The last specimen is in the United States National Museum. The others were sent to me by E. H. Bryan, Jr., of the Bernice P. Bishop Museum, to whom they will be returned except two specimens retained by the writer.

The genus Homoneura was described by van der Wulp for the reception of a species from Sumatra and it is the same concept as Sapromyzosoma Malloch. In the genus there are over a hundred Oriental species known to me, and it contains some well defined segregates which I have just assigned subgeneric names in a paper ready for the press. The Hawaiian species belongs to a group which I have retained in Homoneura in the strict sense, though the arista is only pubescent and the frons is longer and narrower than in the typical form.

A List of Insects Eaten by the Mantis *Paratenodera sinensis* (Sauss.)

BY F. C. HADDEN

(Presented at the meeting of February 4, 1926)

ORTHOPTERA.

Oxya chinensis (Thunb.).
Atractomorpha ambigua Bolivar.
Conocephalus saltator (Sauss.).
Paratenodera sinensis (Sauss.).

HOMOPTERA.

Aphis maidis Fitch.

LEPIDOPTERA.

Spodoptera mauritia (Boisd.).
Pontia rapae (Linn.).
Lycaena boetica (Linn.).

DIPTERA.

Volucella obesa (Fabr.).
Lathyrophthalmus [*Eristalis*] *aeneus* (Scop.).
Lathyrophthalmus [*Eristalis*] *arvorum* (Fabr.).
Eristalis tenax (Linn.).
Simosyrphus [*Xanthogramma*] *grandicornis* (Macq.).
Allograpta obliqua (Say).
Musca vicina Macq.
Chrysomyia megacephala (Fabr.).
Lucilia sericata (Meig.).
Sarcophaga haemorrhoidalis (Fallen).
Sarcophaga barbata Thomson.
Archytas cirphis Curran.
Chaetogaedia monticola (Bigot).

Proc. Haw. Ent. Soc., VI, No. 3, Oct., 1927.

Drosophila immigrans Sturtevant.
Drosophila melanogaster Meigen.

HYMENOPTERA.

Euplectrus platyhypenae Howard.
Pachodynerus simplicicornis (Sauss.).
Casinaria infesta (Cress.).
Xylocopa varipuncta Patton.
Megachile schauinslandi Alfk.
Apis mellifera Linn.
A total of 29 species in 5 orders.

The young mantis when first born immediately moulted. They were very timid, and only attacked small insects such as Aphis, Euplectus, and Drosophila. After the third molt they ate small flies and wasps such as Musca and Casinaria. When full grown they attacked larger insects such as full grown Oxya and even a strong male Xylocopa. They were very careful in catching wasps having a good sting, and would drop them quickly, then "lick" the wound caused by the sting. Both young and full grown grasshoppers were eaten. Small beetles were never touched. The mantis are cannibalistic and when eating a brother or sister they wiggle their palpi, as though "licking their chops," with great relish. Theoretically mantis should be, and probably are, more beneficial than harmful, for it is the common, harmful insects that they catch in greatest numbers.

Saprinus Oregonensis Leconte—A Correction. (Coleoptera).

BY F. C. HADDEN.

(Presented at the meeting of December 2, 1926.)

In the "Fauna Hawaiiensis" collection at the Bishop Museum there is a Histerid beetle labeled *Saprinus oregonensis* Lec. There is also a reference to this species in the Fauna Hawaiiensis, vol. 3, page 510, the above specimen being one of those on which this determination was made.

Upon examining this specimen and comparing it with Histeridae labeled *S. oregonensis* from California in the Giffard collection at the Experiment Station, H. S. P. A., I find that it is not *S. oregonensis*, but agrees structurally with the description and specimens (named by Dr. E. C. Van Dyke, see Proceedings Hawaiian Entomological Society, vol. 4, page 606, 1921) of *Saprinus fimbriatus* Lec. For structural characters see Horn, Synopsis of the Histeridae of the United States, Proceedings, American Philosophical Society, 1873, vol. 13, page 273.

The respective characters are as follows:

	S. fimbriatus Lec.	*S. oregonensis* Lec.
Prosternum	Compresso carinate	Widely convex
Sides of prothorax	Rather densely and coarsely punctured in wide space on each side.	Rather sparsely and coarsely punctured along a narrow space on each side.
Anterior tibiae	Coarsely denticulate.	Not so coarsely denticulate
Sutural striae	Connected with first dorsal (counting from the sutural)	Often shortened at the base and not connected with the first dorsal
Size	2.5 to 4 mm.	4 to 5 mm.

The carinate or keeled posternum widely separates the two groups in which each belongs. As this specimen has the keeled prosternum it cannot be *S. oregonensis* Lec., and as it agrees in every respect with *fimbriatus*, this change should be made.

It is doubtful if there are really any *Saprinus oregonensis* Lec. in the Hawaiian islands, for all the Histerids near the size of *fimbriatus* and *oregonensis* are *fimbriatus*. This beetle is the common, medium sized species found in cow-dung, where it is predaceous on horn-fly maggots and other dipterous maggots.

This reduces the number of histerid beetles in the islands by one species.

Predominance of Pheidole Megacephala (Fab.). (Hymenoptera).

BY J. F. ILLINGWORTH.

(Presented at the meeting of May 6, 1926.)

As I have reported previously, this valuable predaceous ant has driven out of Honolulu many noxious insects, even within the last decade. Less than ten years ago the vicious fire ant, *Solenopsis geminata*, was abundant in my yard in Kaimuki; but it has since been replaced by Pheidole.

It has always been a wonder to me how the smaller Pheidole, without sting, could accomplish this feat. A few days ago I brought in a large colony of fire ants for experiment, from the region near Wahiawa. Conditions are very arid out there, and Pheidole has not yet fully taken possession of the fields. I placed this colony in one of the large root-cages with growing pineapple plants at the University station. My object was to observe the action of this strong excavating species upon the roots of the plants. Much to my surprise, when I went to see how the colony was settling down, on the following morning, I found it entirely destroyed. The place was simply swarming with countless numbers of madly excited Pheidole ants. Not a living fire ant was to be found; broken remains of both species strewn about proclaimed the battle that had raged all night. The Pheidole victors were just beginning to carry away the dead.

I had failed to take the necessary precaution of separating the root-cage from the ground, so an overwhelming colony of Pheidole had moved in, bag and baggage, during the night. Their excavations were being thrown up all over the surface, and along the glass inside, I found that they had reached a depth of about six inches.

To see how this all happened, I placed a fire ant where she could run into a nest of Pheidole. She was at once strongly set upon by the tiny workers. They seized her feet, only to be bitten in two in her powerful jaws. Yet even then with the

abdomen bitten off, they refused to release their grip on her feet. Others rushed to the rescue of their broken mates, and when about seven or more took a hand, they were barely able to hold their victim. They held by every possible appendage: antennae, legs, and even her vicious sting. After an hour it simply became a tug-of-war. More and more workers joined the attackers, but not a single soldier appeared. The newcomers seized the legs of their mates who were already attached. In this way, with lines two and three deep on every appendage they finally held their victim motionless, though it had taken them fully two hours. The losses in their own ranks, as far as I could see, had been eight killed and maimed. At this stage the soldiers appeared, when all danger was past, and began their job of cutting up the victim. The legs were first severed by cutting the soft connecting membranes next to the body, which was also finally cut into bits. When I had to leave at the end of the third hour of contest, the remains were not nearly cleared away.

From these observations it appears to me evident that the predominance of Pheidole in the tropical and subtropical countries lies in their dogged persistence. The little workers are absolutely fearless, attacking insects many times their size, even where they may be instantly crushed to death in powerful jaws. This and other observations show that their splendid team work is entirely due to instinct. I can see nothing suggestive of reasoning in any of their activities.

A Report on Insects and Other Animal Organisms Collected in the Pineapple Growing Section at Mauna Loa, Molokai, June, 1926.

BY J. F. ILLINGWORTH.

(Presented at the meeting of September 2, 1926.)

I here list 69 organisms with brief remarks as to what is known about the habits of each. Undoubtedly some of these creatures have no bearing upon the growing of pineapples. I would place in this class those that are checked with a star (*).

The field work for this report was of necessity very limited. Further collecting, especially at different seasons of the year, would undoubtedly greatly extend the list. At any rate, even with this small beginning, we see the abundance of potential pests that are already turning their attention to pineapples.

Class CRUSTACEA

Order ONISCOIDEA

Family Oniscidae

Porcellio laevis Latr. (Sowbug or damp bug).

Family Armadillididae

Armadillo hawaiiensis Dana (*Spherillo*). (Pill bug.)

Both of these Isopods are abundant under paper in pineapple fields. I watched them feeding on the fertilizer at the base of the plant. Though they feed normally on plant refuse, the indications are that they feed upon living roots during long periods of drought.

Class ARACHNIDA

Order ACARINA (mites)

Family Tyroglyphidae

Tyroglyphus sp. Mites belonging to this genus are abundant in soil among roots of wilting pineapple plants.

Class INSECTA

Order COLLEMBOLA (Springtails)

Very minute insects, belonging to this order, are abundant in old, diseased fields. A tiny, white species, less than 1/25th of an inch in length, does considerable damage to the roots, feeding upon the tender tissues at the growing point.

Order ORTHOPTERA

Family Blattidae

Pycnoscelus surinamensis (Linn.) (Burrowing roach).

In soil about roots, under paper. This roach has a bad reputation as a feeder on roots.

Cutilia soror (Brunner). Another roach of similar habits.

Family Gryllidae

Gryllodes sigillatus (Walker). These crickets are very abundant under paper.

Order DERMAPTERA (Earwigs)

Family Labiduridae

Labidura riparia (Pallas). Thought to be largely predaceous on other insects.

Order HEMIPTERA

Family Reduviidae

Zelus renardii Kol. These large, predaceous "assassin bugs" capture insects of various kinds, on which they feed.

Family Myodochidae

**Nysius delectus* White. In old fields, principally on purslane.

Family Cydnidae

Geotomus pygmaeus Dallas. (Det. by Bryan.)
Burrowing bugs, found in soil among diseased pineapple roots. Kirkaldy states that this species is distributed over the entire oriental region, being also recorded from Celebes and New Caledonia. A European species, found at the roots of grasses, is said to suck the sap from various plants.

Family Coccidae

Pseudococcus brevipes (Cockerell). (Pineapple mealy bug.) Fairly common on pineapple fruit.

Diaspis bromeliae (Kerner). (Pineapple scale.) Fairly abundant on plants and fruit.

Order COLEOPTERA (Beetles)

Family Histeridae

**Saprinus fimbriatus* Lec. Predaceous on dipterous larvae in manure,—evidently from droppings of work animals.

Family Elateridae

Monocrepidius exsul Sharp. The larval wireworms of these click beetles feed on pineapple roots.

Family Anthicidæ

**Anthicus floralis* Lec. On weeds in old fields.

Family Nitidulidæ

Carpophilus humeralis (Fab.) (Pineapple beetle.)
Carpophilus maculatus Murray.

Although these souring beetles have become major pests in most pineapple-growing sections of Hawaii, they are still rare on Molokai.

Family Cucujidae

Cryptamorpha desjardinsi (Guer.). Both the larvae and the adults of this predaceous beetle are destructive to maggots, caterpillars, etc., on pineapples.

Family Coccinellidae

**Diomus notescens* (Blackburn)
**Platyomus lividigaster* Mulsant
**Coelophora inaequalis* (Fabr.)

Predaceous beetles introduced by Koebele from Australia, to prey upon plant lice. They were collected on weeds in old fields.

Cryptolaemus montrouzieri Mulsant. This Australian lady-beetle, now widely distributed in Hawaii, feeds on mealy bugs of the genus Pseudococcus. It is a valuable enemy of the pineapple mealy bug.

Family Scarabaeidae

Adoretus sinicus Burmeister. (Rose beetle.) The larvae (white grubs) feed somewhat on pineapple roots.

Pleurophorus parvulus Chev. Both adults and larvae are closely associated in the soil with new pineapple plants. Possibly they are attracted by the ammonium sulphate fertilizer applied at the time of planting.

**Aphodius lividus* Olivier. These are typcial manure feeders. They are rather abundant in new fields, breeding in the droppings of animals.

Family Tenebrionidae (Ground beetles)

Gonocephalum seriatum (Boisduval)
Alphitobius lateralis (Boheman)
Blapstinus dilatatus Lec.
Epitragus diremptus Karsch

The above four species are very abundant in pineapple fields, especially under paper. Their larvae resemble wirewroms. Although normally they feed on decomposing organic matter in the soil, I suspect that they may eat pineapple roots during periods of drought.

Order LEPIDOPTERA

Family Nymphalidae

**Anosia erippus* Cramer. (Milkweed or Monarch butterfly.) In old fields.

Family Lycaenidae

**Lycaena boetica* (Linn.). In old fields on Crotalaria.

Family Tineidae

Ereunetis flavistriata Walsm. (Det. by Swezey.) (Bud moths.)
Batrachedra rileyi Walsingham. (Det. by Swezey.) (Bud moths.

The moths of both of these species are very abundant in fruiting fields. The caterpillars of the second are pink in color and live largely in the eyes of the fruit, where they feed on the stamens and pistil. The caterpillars of the first are grayish in color and are frequently associated with mealy bugs at the base of the fruit. Both, occasionally, eat into the living tissue of the fruit and may cause the entrance of other organisms of decay.

Order DIPTERA

Family Psychodidae

**Psychoda alternata* Say (Det. by Bryan). Found breeding in drain from houses.

Family Scenopinidae

**Scenopinus fenestralis* (Linn.) (Det. by Bryan.) On window.

Family Syrphidae

**Eristalis punctulatus* Macq.

**Eristalis aeneus* (Scopoli)

Both of these breed in garbage, etc., about camp.

Allograpta obliqua (Say). A valuable predator on plant lice.

Family Tachinidæ

Archytas cirphis Curran (MS). This valuable cut-worm parasite is abundant and thoroughly established.

Family Sacrophagidae

Sarcophaga haemorrhoidalis Fallen. Breeds in human excrement in fields.

Sarcophaga pallinervis Thomson. Breeds in cow dung.

Family Muscidae

Musca vicina Macq. (Housefly.)

Stomoxys calcitrans (Linn.) (Stable fly.)

Haematobia irritans (Linn.) (Horn fly.)

All of these flies are exceedingly abundant in the vicinity of quarters. They breed in the manure-laden soil under stable floors, in manure piles in gardens, and in garbage, etc.

Family Calliphoridae (Blow flies)

Chrysomyia megacephala (Fabr.)

Chrysomyia albiceps Wied.

Both of these flies have a bad reputation, blowing meat and even infesting living animals. They come from India.

Family Anthomyidae

Atherigona excisa Wied. Lives in decaying vegetable matter.

Limnophora arcuata Stein. Hovering fly with spotted abdomen.

Family Ortalidae

Euxesta annonae Fabr. Found breeding in pineapple plants and among the bracts on the under side of the Fruits.

Family Trypetidae

**Dacus cucurbitae* Coquillett. The melon fly, found breeding in cucurbitaceous plants near quarters.

Family Agromyzidae

Milichiella lacteipennis (Loew). Breeds in droppings of animals in fields.

Order HYMENOPTERA

Family Chalcididae

Chalcis obscurata Walker

A valuable parasitic wasp introduced by Koebele from Japan and China. It breeds principally upon leaf-rolling caterpillars of bananas, palms, etc.

Family Braconidae

Chelonus blackburni Cameron. Parasitic on caterpillars

Family Ichneumonidae

Amblyteles koebelei (Swezey)
Echthromorpha fuscator (Fabr.)
Pimpla hawaiiensis Cameron

These are valuable parasites on caterpillars of various kinds; the first two are effective checks upon cutworms.

Family Figitidae

**Eucoila impatiens* (Say). An internal parasite on dipterous larvae, principally of Sarcophagid flies, about quarters.

Family Formicidae

Pheidole megacephala (Fabr.) (Pheidole ant.) This predaceous ant is exceedingly abundant, feeding upon the numerous organisms in the fields. It does some injury to the plants by attending mealy bugs.
Camponotus maculatus (Fabr.) (Large sugar ant.) A very few around the borders of fields and in new ground. These ants also attend mealy bugs.

Family Psammocharidae

Psammochares luctuosus (Cresson) (Det. by Williams).
Collect spiders, to store in their nests.

Family Vespidae

Polistes aurifer Sauss. An important natural enemy of the webbing caterpillars that occur on the fruit.

Family Eumenidae

Pachodynerus simplicicornis (Saussure).
Odynerus petrobius Perkins (Det. by Williams).

These species are constantly seen in the fields, searching for caterpillars about the fruits, to store in their nests.

Family Scoliidae

Scolia manilae Ashmead. This important parasitic check on Adoretus grubs is well established on Molokai.

Family Sphecidae

Sceliphron caementarium (Drury) (Mud wasp).

Notogonidea luzonensis Rohwer (Cricket wasp) (Det. by Williams).

This introduced wasp abundant in fields infested with crickets under paper.

Family Bethylidae

Epyris extraneus Bridwell (Det. by Williams). This wasp is parasitic on the larvae of our ground beetles (Tenebrionidae), so abundant under paper in pineapple fields. (See Proc. Hawaiian Ent. Soc. vol. 4, p 55).

Family Xylocopidae

**Xylocopa varipuncta* Patton. (Carpenter bee)

These large black bees bore into fence posts, etc., to build their nests. They are very partial to redwood timber.

Insects Attracted to Carrion in Southern California.

BY J. F. ILLINGWORTH

(Presented at the meeting of December 2, 1926)

During my visit to Upland, California, in April and May, 1925, I found flies so remarkably abundant that I decided to make a study of them. Residents accounted for this scourge, particularly of the common housefly, as due to the heavy application of stable manure that was being spread on the surrounding orange groves. This fertilizer was brought in on trains from Los Angeles, where it had been collected fresh from the stables. Yet I was especially impressed with the variety and numbers of blowflies present, for there was little in evidence for them to breed upon.

In this work I was particularly interested in studying the various species of flies from a viewpoint of sanitation. While it is a matter of general knowledge that blowflies congregate about carrion to breed, probably few of us realize how attractive this filth is to our common household species.

I was fortunate in securing a cat for bait, which was killed about 6 p. m. May 6th. The next morning swarms of blowflies were buzzing around the carcass. I arranged the bait in a box, so that I could catch most of the insects with a net, when they came to it. These I classified * and counted, entering the results in tabulated form. Altogether I found 23 species of flies attracted to the carcass. Most of them, however, probably came to feed, for the only larvae that I saw breeding out were those of *Lucilia sericata* (Meign.) and *Sarcophaga plinthopyga* Wied.

On the morning of the 8th, the masses of Lucilia eggs were hatching, and there were half grown larvae of the Sarcophagid. The weather was cool and cloudy, though the sun came out, and it was warm by 10 o'clock. There was no noticeable odor from the carcass. Yet houseflies began to be attracted to it, as well as several other species.

May 9th, the weather was again cloudy and cold. I found the first full fed larvae of the Sarcophagid, ready to enter the soil to pupate. These make remarkably quick growth. Half a dozen large Silphid beetles, *Necrophorus nigritus* Mann. were under the carcass feeding on maggots. The number of houseflies, as will be noticed in the table, was far greater than of any of the other species. They were feeding upon the putrifaction, and the abdomens of those captured were distended with this rotten mess.

May 10th, cold in the morning and cloudy, cool in the afternoon. The odor was increasingly bad, for the abdominal wall of the cat had broken through. I was surprised to find that as the odor of the carcass increased, its attractiveness to blowflies apparently decreased, but just the reverse was true of the houseflies, *Musca domestica* L. and *Fannia scalaris* (Fabr.)

* I was assisted in the determination of the diptera by Dr. J. M. Aldrich, of the U. S. National Museum. He found two of the species new to science. One he described as *Hydrotaea dissimilis;* the other is *Hippelates* n. sp. Dr. Van Dyke, of the University of California, determined the beetles.

May 11th, morning cool and cloudy, but sunny in the afternoon. The carcass was pretty well broken down with a very bad odor. Houseflies were exceedingly abundant, gorging themselves upon the decaying liquids. More predators of the maggots were congregated under the carcass. These were: the large Staphylinid beetle, *Creophilus villosus* (Grav.) and the Histerids, *Saprinus lugens* Er., *Saprinus lubricus* Lec., and *Saprinus fimbriatus* Lec.

May 12th, the weather was warm and sunny. The carcass was pretty well dried out, but still odoriferous and full of a mass of writhing maggots. Houseflies continued abundant, and clouds of very tiny flies had congregated. I was surprised to find that these were *Piophila casei* (L.) the adult of the cheese maggot, and a *Hippelates* sp. Another tiny fly that increased greatly in numbers with the odor was *Fannia femoralis* Stein.

May 13th, morning sunny, but cool, and rainy in the afternoon. The carcass had lost most of its hair during the night, through the activities of the predaceous beetles after maggots. The odor was now considerably reduced, because of the dryness, still the houseflies were numerous. Among the new scavengers present I found *Silpha lapponica* Hbst., *Saprinus oregonensis* Lec., and four small species of Staphylinids: *Philonthus umbrinus* (Grav.), *Platystethus americanus* Er., *Aleochara bimaculata* Grvh., and *A. bipusulata* (L.). Attracted to the dry skin were *Dermestes vulpinus* Fabr., *Necrobia rufipes* Fabr., and *Nitidula ziczac* Say.

May 14th, morning sunny but cool. I was interested to see how attractive the carcass remained to the houseflies. The numbers of maggots were greatly reduced by the predaceous beetles, etc. I found ants also making inroads upon the fly larvae.

May 15th, morning cloudy and cool. The carcass was very dry with scarcely any odor. Most of the dipterous larvae were now ready to pupate, some of them entering the soil. In order to record later developments, I transferred the carcass with the soil, debris, and all the maggots to a tight box. This was fitted up with a glass vial in the end, for collecting the emerging insects.

The large Sarcophagid larvae that entered the soil May 8th were still in the prepupal stage, able to move about freely. I placed these in a separate container for further observation. They pupated on the 18th, but never emerged. Evidently they were all eaten by the predaceous Silphid larvae, inadvertently left in the same soil. I found many of these, May 21st, about one-half inch in length, in the larger box, where they were feeding ravenously upon the pupae of the blowflies.

May 29, the emergence of *Lucilia sericata* started. Of the 24 flies that came out into the vial, 22 were males and 2 females. May 30th, 1,400 emerged, all of the same species, 77 per cent males. May 31st, 330 came out, 60 per cent males. June 1st only 192 flies issued, but 80 per cent of these were females. This was the end of the emergence.

June 2nd, the box was opened and the soil found dry as powder. Many fat Silphid larvae were present. They evidently had destroyed a large percentage of the dipterous larvae. As noted above, the only ones that came through were the Lucilias It would be interesting to know why the other carrion-breeding species all failed.

In the following table, the species of flies are listed in the order in which they came to the carcass. The first and second days these were predominantly *Lucilia sericata*, but by the third and fourth days these were replaced by the houseflies. I was disgusted to find that these latter flies at night came straight from the rotten carcass to the house, about 100 feet away, where they roosted all over the screens. Those that I caught there had their abdomens distended with the filthy matter on which they had been feeding.

FLIES ATTRACTED TO CARRION

	MAY							
Species captured 1st day.	7	8	9	10	11	12	13	14
Lucilia sericata (Meign.)	1888	1530	318	70	196	237	62	32
Fannia canicularis (Linn.)	22	10	2	90	32	26	30	0
Calliphora erythrocephala (Meign.)	8	80	12	10	10	0	21	0
Musca domestica Linn.	6	350	3398	4610	4342	2679	1520	1060
Sarcophaga plinthopyga Wied	6	4	0	8	0			
Phormia regina (Meign.)	2	10	112	50	280	297	70	0
Mycetophilid	2	0						
New arrivals, 2nd day								
Muscina stabulans (Fall.)		110	36	20	22	10	9	8
Muscina assimilis (Fall.)		9	24	0	0	14	42	0
Fannia scalaris (Fabr.)		90	118	1850	788	420	1440	140
Hydrotaea houghi Malloch		7	4	0	10	3	0	
New arrivals, 3rd day								
Piophila casei (Linn.)	..	..	28	60	76	380	80	90
Hippelates n. sp.			80	290	360	420	100	80
Hydrotaea occulta (Meign.)			4	0				
Hydrotaea dissimilis Aldrich			2	9	4	0		
Ophyra nigra Wied			22	230	392	336	20	40
Fannia femoralis (Stein)			16	100	338	580	0	9
New arrivals, 4th day								
Chrysomyia macellaria (Fabr.)				4	4	2	0	
Paralucilia fulvipes (Macq.)				2	0	1	0	
Leria pectinata (Lw.)				10	0	4	0	
Drosophila repleta Woll.				12	0			
Hylemyia cilicrura Rdi.				6	0			
Euxesta notata (Wied.)				2	0			
TOTALS	1934	2200	4176	7433	6834	5405	3394	1459

The Sisal Borer in Hawaii. (Coleoptera).

BY O. H. SWEZEY

(Presented at the meeting of January 7, 1926.)

The first specimen of this immigrant curculionid beetle collected in the Hawaiian Islands was found by Mr. F. Muir crawling on a window sill of the lavatory in basement of the main building of the Experiment Station, H. S. P. A., Honolulu, Dec. 17, 1918.[1] Another specimen was collected by Mr. T. L. Bissell, June 1, 1922, at the fruitfly office in Honolulu.[2] A third beetle was taken by Mr. G. P. Wilder at his residence, 1930 Ualakaa St., Honolulu (date unknown).

From poor specimens at hand of the Mexican sisal borer, or "max beetle," it has been considered that this was the same, and a lookout has been kept for the work of it in sisal here. The first evidence of its work was found by Mr. Bissell, Feb. 14 and 18, 1924, in a dead sisal plant back of the U. S. Experiment Station, Honolulu.[3] In this sisal plant, numerous dead beetles were found, mostly broken, and dead pupae and larvae in pupal cases. There were about 200 of the latter, which were a sort of cocoon made of the fibers of the plant. There were many exit-holes in the stem. This would indicate that the insect was well established in that locality, but examination of a nearby dying sisal plant revealed no evidence of the insect or its work.

Since that time, sisal, or century plants have been examined in various places about Honolulu without finding any further evidence of the insect. On Dec. 27, 1925, 34 of the beetles, a larva and a pupa were handed me by Philip Westgate with the explanation of their capture. He had collected them in a variegated leaved century plant (*Agave mexicana*) that was standing in front of the residence of the Director of the U. S. Experiment Station. The plant was producing its flowering stalk which

[1] Proc. Haw. Ent. Soc., IV, p. 247, 1920.
[2] Proc. Haw. Ent. Soc., V, p. 344, 1924.
[3] Proc. Haw. Ent. Soc., VI, p. 8, 1925.

was already about 10 feet tall. Some of the lower leaves were dying, and investigation had shown them to be rotten at the base, as well as part of the main stem of the plant, and the beetle and its larvae quite numerous, apparently the cause for the decay.

I examined this plant Jan. 1st, and also some others nearby and found them to be infested also. Specimens of the larvae and pupae were obtained for preservation.

There has been some uncertainty as to the species of this insect. The Mexican sisal borer is **Scyphophorus acupunctatus* Gyll. Our specimens agree fairly well with specimens from Mexico which are in the cabinets at the Experiment Station, H. S. P. A. Some of the present lot of specimens have been sent away for comparison and determination.

Hyposoter exiguae (Viereck) in Hawaii. (Hymenoptera).

BY O. H. SWEZEY

(Presented at the meeting of June 3, 1926)

Recently this ophionid has been found parasitizing armyworms quite abundantly. It was first discovered at the Waialae Ranch, October 28, 1925, when a few cocoons were found on grass leaves and the parasite reared from them. It was not till some more cocoons were found on grass in a field of sorghum at the Hind-Clarke dairy at Wailupe, November 13, that the host was determined in these cases. Beside each cocoon was the caterpillar skin of the host, which could be identified as that of *Spodoptera mauritia* (Boisd.). Similarly, two cocoons of this parasite were found on corn leaves at the U. S. Experiment Station, November 25. In each case, a caterpillar skin of *Spodoptera exigua* (Hüb.) was present. A few small larvae of this moth were feeding on the corn leaves. On November 27 the cocoons were found very abundant on grass at Koko Head, where caterpillars of *Spodoptera* were numerous. Several hundred of these cocoons were collected and sent to Olaa, Hawaii, in an attempt to establish the parasite on that island, as we did

* This determination was confirmed by Dr. Guy A. K. Marshall of the Imperial Bureau of Entomology in letter dated February 5, 1926. [Editor.]

not then know of its being established there. A small number of cocoons were taken to Molokai in December, where the adults that issued were liberated.

On February 7, 1926, cocoons were found on Bermuda grass near the shore between Waimanalo and Makapuu Point. A few *Spodoptera mauritia* caterpillars were present in the grass and indicated what the host was in this case.

On February 21, in Kawaihapai Valley on the north side of the Waianae Range, I found some *Dodonaea* trees on which the caterpillars of *Scotorythra paratactis* Meyrick were quite numerous. Several cocoons of *Hyposoter* were found on the trees and several of the parasites were reared from caterpillars that were collected for rearing.

On February 27, at Spreckelsville, Maui, I found cocoons on the leaves of *Nicotiana glauca*, and reared the parasite from a caterpillar of *Spodoptera exigua*, several of which were feeding on the same leaves.

On March 3, at Waiopai, Maui, on the south side of Haleakala, at about 700 feet elevation, quite a good many old cocoons were found on grass which had been infested with armyworms. Only a few were present at the time, and they were *Cirphis unipuncta* (Haw.). Three of this same armyworm were found parasitized by *Hyposoter* in Bermuda grass near the Haleakala Ranch office, March 4.

March 5, Mr Van Zwaluwenburg found the cocoons abundant and parasitized armyworms in waste land across an irrigation ditch from a cane field at Wailuku Sugar Co., Wailuku, Maui. On the same day, at Lahaina and Olowalu, Maui, cocoons were found in nut grass at the former and in Bermuda grass at the latter.

May 13 I found two cocoons on ferns in the Olinda koa forest on Maui. I could not be positive of the host in this instance, but the old caterpillar skins appeared to be those of *Nesamiptis obsoleta* (Butl.) a grass-feeding caterpillar. These records indicate quite a wide spread on Maui already, where the parasite has become established of itself and dispersed naturally.

Apparently the parasite became established from the colony sent to Olaa, Hawaii, in November, 1925, for on May 8, 1926, I found their cocoons readily in a cane field near where the

colony was placed. I also collected two adults. Their host there was the common armyworm (*Cirphis unipuncta*), except that I found one of their cocoons with the empty skin of the caterpillar of *Plusia chalcites* (Esp.) attached. A few cocoons were found in grass of a roadside some little distance from this field. From this beginning, it will no doubt spread very widely on Hawaii.

On May 11, I found two cocoons in grass at Waikii in the Parker Ranch at an elevation of 4,700 feet. *Cirphis unipuncta* was the host there. The parasite must have reached this place independently, for I know of no colonies having been sent there for liberation.

Specimens of the parasite were sent to the U. S. Bureau of Entomology for determination, and in a letter from Dr. Howard dated May 4 he informs me that Mr. Cushman has determined it as *Hyposoter exiguae* (Viereck), originally described from California, where it was reared from *Laphygma exigua*. He stated that it had been reared from *Prodenia ornithogalli* also in Arizona. *Hyposoter* is a subgenus of *Campoplex*, which name I had been using while awaiting authoritative determination.

It is not known of course how this parasite arrived here from California. Perhaps as living cocoons in baled hay, or more likely on some kind of fresh vegetables. At any rate, it is already widely spread, and gives promise of being a very valuable armyworm parasite. So far its known hosts here include *Cirphis unipuncta, Spodoptera mauritia, S. exigua, Plusia chalcites, Nesamiptis obsoleta* (?), and *Scotorythra paratactis*. The latter being a close relative of the caterpillar (*Spodoptera paludicola*) that recently defoliated the koa forest at Olinda, Maui, and the fact that I found *Hyposoter* already there, may indicate that it might help in preventing a repetition of such defoliation of the koa forests. Of 35 caterpillars of *Spodoptera mauritia* collected at Koko Head, November 27, this parasite was reared from 8.6% of them. The large number of cocoons found on the grass at that place would indicate a much higher rate of parasitism.

Spodoptera mauritia caterpillars were very readily parasitized in a breeding jar, mostly the smaller or half-grown ones being used. The parasite larva makes a rapid growth inside the

caterpillar, but I neglected to take note of the dates for record. When the parasite larva is full-grown, the caterpillar dies on the leaf where it has been feeding and the parasite larva emerges from the skin and spins its cocoon in this position, the empty caterpillar skin remaining attached at one end of the cocoon. One parasite larva was observed to commence spinning the network for its cocoon before it had fully issued from the skin of the caterpillar. The cocoon is cylindrical, symmetrically rounded at both ends, about 6 mm. long, rather dense, white with a few dark patches. In one instance observed, the adult issued from the cocoon 8 days after the cocoon was commenced. The life cycle, though not accurately determined, is probably about 3 or 4 weeks. A short life cycle as compared with that of its hosts.

Notes on Rhyncogonus extraneus (Col.).

BY O. H. SWEZEY

(Presented at the meeting of October 7, 1926.)

This weevil was described by Perkins in The Fauna Hawaiiensis, III, Part VI, p. 651, 1910. The date of capture was not given. The habitat given is, "Oahu; lower slopes of the mountains, below the forest." In correspondence with Dr. Perkins concerning this and other species of Rhyncogonus, the following remarks on *extraneus* were made in a letter dated March 20, 1923:

> "The original specimens came from the lower slopes of the mountains (below forest) Kalihi-way, and I think were found on one of the common Verbenaceous weeds. Either this or something very similar occurred years ago in Kau, near Kapapala (Monsarrat's ranch), also I believe on the same plants. I seem to have none of these Hawaii specimens myself at this time, but there ought to have been some at the Board of Agriculture lab. or at the H. S. P. A. Experiment Station. Possibly they were never mounted, as we were in the thick of the lantana campaign at the time. It is, however, possible that the Kau species was the same as

one Giffard sent to Dr. Sharp from Kona; also many years ago either Henshaw or Koebele collected a species on Eben Low's ranch or thereabouts. I had one of these unmounted (in alcohol) and I may still have it, though I never pinned it up.

"I have always had great doubt whether *R. extraneus* was a real native; as is indicated by the specific name, I believe it will be found elsewhere." . . . .

"In the Introduction to the Fauna Hawaiiensis on page cxx where in discussing the distribution of Rhyncogonus, I said: 'None are known from Hawaii,' I really meant to say that the genus was not represented by *endemic* species on Hawaii."

Besides the specimens collected by Dr. Perkins in the vicinity of Kalihi, the only other collections of this beetle on Oahu have been made from a colony in field 20 of the Oahu Sugar Co. This field is located in the part of the plantation towards the Waianae Mountains. It is on the Kunia road about a mile north from the government road leading to Ewa and Waianae. In this field, a number of the beetles were collected by Terry, December 31, 1904. No significance was attached to this at the time, and no subsequent attention was given to it. Until November 29, 1922, no more observations were made, but apparently the colony had been increasing during this interval, for on the latter date the beetles were quite abundant on the leaves of young cane, and their grubs were numerous in the soil. Some of them were feeding on the decaying cane seed cuttings in the ground.

On December 29, further observations were made, and it was found that the colony was very extensive, spreading over an area several hundred yards across, but concentrated most abundantly in two smaller areas. The beetles were found both on cane leaves and on weeds. However, no eating was done on the cane leaves. Such weeds as Portulaca and Amaranth growing on ditch banks were eaten to some extent. Quite a lot of the beetles were in pairs. Some were collected alive, and oviposition was secured. Of 140 beetles collected on cane leaves, 46 were females and 94 were males. Thirty-one of the females were dissected and found to contain eggs as follows: 6, 8, 4, 15, 13, 4,

11, 28, 3, 4, 9, 6, 11, 2, 7, 4, 3, 9, 12, 7, 1, 0, 6, 16, 12, 3, 5, 6, 12, 6, 9. A total of 242, and an average of 7.8 eggs per female.

Experiments were made in confinement to determine the food plants of the beetles. They ate Portulaca and Amaranth (probably Euxolus) readily; Hibiscus, Crotalaria and Emilia very little; cane, koa and Waltheria not at all. Grubs in confinement were found to eat into pieces of cane at cut surfaces, and to eat fresh cane roots.

In ovipositing, clusters of from two to a dozen eggs were placed side by side in a crease or wrinkle of the leaf or turned over edge and held in position by an adhesive secretion. The egg is white, smooth, cylindrical, rounded at ends, sometimes slightly curved, 1.2 mm. long, .6 mm. in diameter. The eggs hatch in about 8 days, and the young grubs take 3 or 4 months to grow.

Since 1922, whenever this colony in field 20 has been visited, a few beetles could be found, sometimes more numerous than at other times, but whether there is any definite seasonal occurrence has not yet been determined. At the latest visit by Mr. Hadden and myself, September 14, we secured 3 or 4 dozen beetles in about 20 minutes. The cane at the time was of large size, and searching was difficult except along ditch banks. The beetles we obtained, however, were mostly from the cane leaves, and quite high up at that. No signs of cane leaves having been eaten by the beetles was observed.

Foreign Sphingidae in the Collections of the Experiment Station of the Hawaiian Sugar Planters' Association.

BY O. H. SWEZEY

(Presented at the meeting of October 7, 1926.)

Recently the specimens of foreign Sphingidae in the collections of the Experiment Station of the Hawaiian Sugar Planters' Association were sent to Mr. B. Preston Clark, Boston, Mass., for determination. The list of these follows. They are arranged in the order that they occur in "The Revision of the Sphingidae," by Rothschild and Jordan, Novitates Zoologicae, IX, Supplement, 1903.

Subfamily Acherontinae

1 *Herse convolvuli* (Linn.). 6 specimens. Hongkong, 1908 (Terry); Los Banos, P. I. (Williams).

2 *Acherontia lachesis* (Fabr.). 2 specimens. Los Banos, P. I. (Williams).

3 *Acherontia styx* (Westw.). 2 specimens. Los Banos, P. I., ex Sesamum (Williams).

4 *Psilogramma menephron menephron* (Cramer). 6 specimens. Japan (Jordan); Hongkong, 1908 (Terry); Larat, 1907 (Muir); Ceram, 1909 (Muir).

5 *Cocytius duponchel* (Poey). 1 specimen. Tena, Ecuador, 1923 (Williams).

Subfamily Sesiinae

6 *Isognathus caricae* (Linn.). 2 specimens. Blairmont, British Guiana, ex alamanda vine (Williams).

7 *Erinnys alope* (Drury). 2 specimens. Banos, Or., Ecuador, 1923 (Williams).

8 *Sesia titan* (Cramer). 2 specimens. Banos, Or., Ecuador, 1923 (Williams).

Subfamily Philampelinae

9 *Panacra mydon mydon* Walker. 10 specimens. Hongkong, 1908, ex taro (Terry).

10 *Macroglossum insipida* Butler. 1 specimen. Los Banos, P. I., 1916 (Williams).

11 *Macroglossum sitiene* Walker. 1 specimen. Hongkong, 1908 (Terry).

Subfamily Choerocampinae

12 *Hippotion echeclus* (Bdv.). 1 specimen. Manila, P. I., 1907 (Thompson).

13 *Hippotion boerhaviae* (Fabr.). 1 specimen. Los Banos, P. I. (Williams).

14 *Theretra clotho* (Drury). 2 specimens. Manila, P. I., 1907 (Thompson); Hongkong, 1908 (Terry).

15 *Theretra oldenlandiae* (Fabr.). 1 specimen. Hongkong, 1908 (Terry).

16 *Theretra silhetensis* (Walker). 1 specimen. Los Banos, P. I. (Williams).

Notes on Some Forest Insects of Molokai.

BY O. H. SWEZEY AND E. H. BRYAN, JR.

(Presented at the meeting of April 1, 1926)

One of the regions of the Hawaiian group which has received but little attention since it was collected in by Dr. R. C. L. Perkins, thirty years ago, is the mountainous interior of east Molokai. During the week preceding Christmas, 1925, the two authors made a field trip for the Bishop Museum into the western end of these mountains. They were kindly assisted in this undertaking by Mr. George Cooke, manager of the Molokai Ranch, who allowed them to use the McVeigh cabin, and provided transportation through Mr. Fred Conant.

The McVeigh cabin is located in a grove of Eucalyptus trees on the upper south slope, at an elevation of 3,370 feet. About three-quarters of a mile to the eastward one comes to the brink of Waikolu valley, which drops abruptly two thousand feet to the valley bottom, which extends to the north coast. The upper slope or plateau is fairly flat, ranging in elevation from 3,000 to 4,000 feet, but its surface is cut by numerous deep gulches. The region is accessible over a rough road, which continues past the cabin for a mile or more, and formerly extended to Puu o Kaeha.

The region was originally covered by heavy forest, but this has been killed off, largely by cattle roaming through it. For the past several years cattle have been excluded from the region, and the forest is beginning to recover. At present it is covered by an open scrub, consisting of small lehua trees, Wikstroemia, ferns, grass and herbs, with occasional stunted Byronia, Gouldia, Suttonia and Raillardia trees, and Sadleria and Cibotium tree ferns.

Just south of the house lies a deep fork of the Kaunakakai Gulch, which we called "Kamiloloa, 3,200 feet," as it occupies the head of Kamiloloa district. The bottom of this gulch, having been inaccessible to cattle, contains a good growth of native and other vegetation. This includes Coprosma, Pipturus,

Straussia, Dubautia, Dodonaea, Cyathodes, Sadleria, staghorn fern, sedges and several grasses.

A pipe-line trail crosses this gulch and continues southeast across three other gulches to a small plateau, the highest point of which is Puu o Kaeha, 3,731 feet. This region we called "Kawela, 3,700 feet," as it lies at the head of Kawela gulch and district. To the east and northeast of here rises the high, swampy interior of the Molokai mountains.

During three of the five days spent in this region, practically all collecting was prevented by heavy downpours of rain, driven before a Kona wind. Also, during the two clear days, the dampness made collecting relatively poor. Nevertheless, a good quantity of material, including several new species, was secured, which demonstrates the desirability of more extensive collecting in these mountains at an early date. On this trip the collecting was done mainly in the vicinity of the McVeigh cabin, in Kamiloloa gulch, on the way to and from Kawela, and along the brink of Waikolu valley. The specimens listed as "Kaunakakai, 2,400 feet" were secured along the road between the McVeigh cabin and the water tanks at 2,385 feet elevation. The specimens are in the Bishop Museum.

HYMENOPTERA

Ichneumonidae

Amblyteles koebelei (Swezey), 1 Kawela.
Echthromorpha fuscator (Fabricius), 1 Kamiloloa, 1 Kawela.
Pimpla hawaiiensis Cameron, 1 Kamiloloa, 1 Kawela, 1 Waikolu.
Eremotylus orbitalis Ashmead, 1 Waikolu.
Enicospilus bellator Perkins, 3 Kawela, about Metrosideros.
Enicospilus mauicola Ashmead, 1 Kamiloloa, 1 Kawela.
Enicospilus molokaiensis Ashmead, 2 Kawela.
Atrometus sp., 1 Waikolu.
Limnerium blackburni Cameron, 1 Waikolu.
Pristomerus hawaiiensis Perkins, 6 Kawela, 1 Waikolu.
Cremastus hymeniae Viereck, 2 Kawela.

Alysiidae

Aspilota konae Ashmead, 1 Kawela, 1 Kamiloloa.

Braconidae

Chelonus blackburni Cameron, 1 Kamiloloa, 1 Kawela, 1 Waikolu.

Ischiogonus palliatus (Cameron), 5 Kamiloloa, ex *Plagithmysus molokaiensis* in dead Pipturus.

Bethylidae

Sclerodermus n. sp. 12 Kamiloloa, ex *Xyletobius proteus* Perk. in dead Coprosma.

Sclerodermus sp. 1 Kamiloloa, in dead Pipturus.

Sierola spp. 4 or 5 species; 7 Kamiloloa, 2 Kawela, 1 Kaunakakai; on Coprosma, Metrosideros, Pipturus, and Dodonaea.

Dryinidae

Pseudogonatopus perkinsi (Ashmead), 1 Waikolu, 1 Kamiloloa, on Metrosideros.

Diapriadae

Phenopria hawaiiensis Ashmead, 1 Kawela.

Scelionidae

Telenomus sp. near *despiciendus* Perkins, 1 Kawela, on ferns.

Figitidae

Hypodiranchis spp., probably 3 or 4 species; 4 Kamiloloa, on Coprosma, 1 Waikolu, 3 Kawela.

Chalcididae

Chalcis obscurata Walker, 2 Kawela.

Encyrtidae

Eupelmus spp., 4 species; 3 Waikolu, 4 Kamiloloa.

Anagyrus spp., probably 4 or 5 species; 2 Kamiloloa, on Coprosma and Pipturus, 3 Kawela, on Metrosideros.

Pseudaphycus utilis Timberlake, 9 Kaunakakai, 2,000 feet, ex *Pseudococcus nipae* on guava.

Habrolepoidea sp. (?), 1 Kawela.

Pteromalidae

Pteromalid, 3 Kamiloloa, on Coprosma.

Eulophidae

Secodella metallica (Ashmead), 8 Kamiloloa, on Pipturus, Coprosma; 10 Kawela, on Metrosideros.

Eulophids (?), 3 species; 5 Kamiloloa, on Pipturus and Coprosma, 1 bred from Gracilaria in Raillardia leaves; 3 Kawela, on ferns; 1 Waikolu.

Euplectrus platyhypenae Howard, 1 caterpillar of *Cirphis unipuncta* with a bunch of larvae on its back which failed to rear out, Waikolu.

Mymaridae

Polynema terrestris Perkins, 2 Kawela, on ferns.

Formicidae

Ponera perkinsi Forel, 3 Kawela, under log.

Prenolepis bourbonica Forel, 1 Kaunakakai, 2,400 feet, on Metrosideros.

Eumenidae

Odynerus instabilis Perkins, 2 Kawela.

Larridae

Dolichurus stantoni Ashmead, 1 Kawela.

Vespidae

Polistes aurifer Saussure, 1 McVeigh's, on window.

Apidae

Apis mellifera Linn., 1 Waikolu.

DIPTERA

Tipulidae

Craneflies of several species were sent to Prof. Charles P. Alexander for determination. They were found on window at McVeigh cabin, and on ferns at Kawela.

Chironomidae

Ceratopogon n. sp. 14 Kawela.

Mycetophilidae

Neosciara molokaiensis (Grimshaw), 1 Kawela, on Metrosideros, 1 Kamiloloa about Pipturus.

Dolichopodidae

Four or five new species of Campsicnemis or allied genera; 27 Kawela, 2 Kamiloloa, 3 Kaunakakai.

Lonchopteridae

Lonchoptera sp. 15 Kamiloloa, in Bermuda grass on bank of stream.

Syrphidae

Simosyrphus grandicornis (Macquart), 3 Kawela.
Allograpta obliqua (Say), 1 Kamiloloa, 1 Waikolu.

Calliphoridae

Dyscritomyia sp. near *terryi* Bryan (MS), 1 Kawela, 1 Kamiloloa, 1 Waikolu.
Calliphora vomitoria (Linn.), 1 Kaunakakai, 2,400 feet, 2 Kawela, 2 McVeigh's cabin.

Sarcophagidae

Sarcophaga pallinervis Thomson, 1 Waikolu.

Muscidae

Stomoxys calcitrans (Linn.), 1 McVeigh's cabin, on window.
Synthesiomyia nudiseta van der Wulp, Kaunakakai, 2,000 feet.

Anthomyiidae

Limnophora arcuata Stein, 1 Kawela.
Lispocephala sp. (formerly known as Coenosia), 5 Kawela, 4 Waikolu.

Sapromyzidae

Sapromyza sp. 1 Kamiloloa, 1 Waikolu, 1 McVeigh's cabin.

Trypetidae

Tephritis sp. near *crassipes* Thomson, 1 Kawela.

Drosophilidae

Drosophila spp. 2 or 3 probably new; 6 Kamiloloa, about Pokeweed, 9 Kawela, 5 Waikolu.

Agromyzidae

Agromyza sp. 3 Waikolu, on Wikstroemia, the leaves of which are mined by the larvae.

COLEOPTERA

Carabidae

Chalcomenus molokaiensis Sharp, 3 Kawela, under stones.
Mecyclothorax sp. 1 Kawela, under stone.

Metrothorax curtipes Sharp, 10 Kamiloloa, 10 Kawela, 1 Waikolu; ex dead Pisonia, roots of sedge, and under stones.
Bembidium molokaiense Sharp, 3 Kawela, under stones.

Staphylinidae

Philonthus turbidus Er., 1 Kamiloloa.
Philonthus nigritulus (Grav.), 2 Kamiloloa.
Oligota sp., 1 Kawela.
Atheta coriaria (Kr.), 1 McVeigh's cabin.
Osorius rufipes Mots., 1 Kawela

Coccinellidae

Scymnus notescens Blackburn, 1 Kawela on Lythrum.
Cryptolaemus montrouzieri Muls., 5 Kaunakakai, 2,400 feet, on *Dodonaea viscosa*, 1 Kawela.

Cucujidae

Cryptamorpha desjardinsi (Guer.), 1 Kawela.

Nitidulidae

Gonioryctus sp., 1 Kamiloloa, on Pipturus.
Eupetinus curtus Scott, 3 Kawela, on Metrosideros, 3 Waikolu.

Anobiidae

Xyletobius proteus Perkins, 30 Kamiloloa, in dead Coprosma.
Mirosternus sp., 1 Kamiloloa.

Cioidae

Cis signatus Perkins, 1 Kawela.
Apterocis ephistemoides (Sharp), 4 Kamiloloa, in dead Pipturus.

Cerambycidae

Plagithmysus molokaiensis Perkins, 26 Kamiloloa, bred from dead Pipturus.

Bruchidae

Bruchus prosopis Leconte, 1 Kaunakakai, 2,400 feet; Kawela, resting on Metrosideros.

Tenebrionidae

Gonocephalum seriatum (Boisduval), 1 Kawela, on Metrosideros.

Anthribidae

Araecerus fasciculatus (De Geer), 1 Kamiloloa.

Curculionidae

Pantomorus godmani (Crotch), 2 Kamiloloa, 1 Kawela, 1 Waikolu.

Dryophthorus squalidus Sharp, 16 Kamiloloa, ex dead Pisonia.

Oodemas brunneum Perkins, 7 Kamiloloa, ex dead Pipturus, 1 Waikolu.

Proterhinidae

Proterhinus hystrix Sharp, 9 Kawela; 19 Waikolu, in dead frond stems of *Cibotium menziesii*

Proterhinus subangularis Perkins, 5 Kawela, ex dead Straussia.

Proterhinus convexiusculus Perkins, 3 Kamiloloa, on Coprosma.

Proterhinus sp. Kaunakakai 2,400 feet, on Metrosideros.

LEPIDOPTERA

Caradrinidae

Eriopygodes euclidias (Meyrick). Caterpillars were found on various ferns, but none reared.

Cirphis pyrrhias (Meyrick), Kamiloloa, 1 full-grown caterpillar found hiding in rocky bank near sedge. Died just before issuing from pupa.

Cirphis unipuncta (Haw.), 1 Kawela, reared from pupa found under log.

Agrotis cinctipennis (Butler), Kawela, 2 caterpillars found on Lythrum; 1 reared to maturity.

Agrotis chersotoides (Butler), Kawela, caterpillars numerous on pokeweed; 11 reared to maturity.

Euxoa wikstroemiae Swezey, Waikolu, 1 reared from caterpillar on Wikstroemia.

Plusiadae

Nesamiptis obsoleta (Butler), 1 Kawela.

Hydriomenidae

Eucymatoge monticolans (Butler), Kawela, 2 reared from green larvae on Cyathodes.

Selidosemidae

Scotorythra trapezias Meyrick, Kawela 3 green and 1 reddish caterpillars on Dodonaea. Failed to rear, but probably this species.

Sphingidae

Celerio calida (Butler), Kawela, 1 caterpillar on Coprosma, reared to adult.

Nymphalidae

Vanessa tammeamea Eschscholtz, Kamiloloa and Waikolu, adults; larvae on Pipturus, none reared.

Lycaenidae

Lycaena blackburni (Tuely), 2 Kawela, 1 reared from larva on Dodonaea.

Pyraustidae

Omiodes anastrepta Meyrick, 1 Kawela.

Omiodes localis (Butler), Kamiloloa, 1 reared from larva on native Panicum grass.

Omiodes monogramma Meyrick, Kamiloloa, 2 reared from larvae on Dianella.

Omiodes scotaea (Hampson), Waikolu, 4 reared from larvae on Astelia.

Phlyctaenia stellata (Butler), Kamiloloa, larvae on Pipturus; failed to rear through.

Phlyctaenia endopyra Meyrick, Kawela, 1 reared from larva on native Rubus. Larvae were quite numerous.

Phlyctaenia pyranthes Meyrick, Waikolu, larvae common on Vaccinium, 3 reared.

Pyrausta constricta (Butler), Waikolu, 1 reared from larva on Scaevola.

Mestolobes ombrias Meyrick, 1 Kawela.

Pterophoridae

Platyptilia rhynchophora Meyrick, 1 Kawela, 2 Waikolu, 1 reared from larva on Vaccinium.

Gelechiadae

Aristotelia notata Walsingham, 1 Kawela, 2 Waikolu on Gouldia. Probably leafminer, though none reared.

Hyponomeutidae

Hyposmocoma lupella suffusella Walsingham, Kamiloloa, larval cases in dead Pipturus wood, 1 reared.

Hyposmocoma sp. Apparently an undescribed species; too much rubbed for description. Kamiloloa, 1 reared from very long larval case among dead leaves at base of tuft of grass.

Hyposmocoma saccophora Walsingham, Kawela, larval case only, on rocks.

Hyposmocoma chilonella triocellata Walsingham, Kamiloloa, 2 reared from dead wood of Pipturus.

Diplosara lignivora (Butler), Kamiloloa, larval cases under bark of dead Pisonia, none reared.

Tortricidae

Eccoptocera foetorivorans (Butler), Waikolu, on Metrosideros.

Archips postvittanus Walker, 4 Waikolu, reared from Wikstroemia and Vaccinium.

Archips sp. near *leopardellus* Walsingham, Waikolu, 2 reared from Suttonia.

Carposinidae

Heterocrossa sp. Larvae in terminal buds of Metrosideros, none reared.

Tineidae

Philodoria auromagnifica Walsingham, Kawela, 1 reared from leaf-mine of Suttonia.

Philodoria floscula Walsingham, 5 Kamiloloa, collected on Pipturus (leaf-miner).

Philodoria n. sp. Kawela, 2 reared from leaf-mines of Lysimachia.

Gracilaria neraudicola Swezey, 3 Kamiloloa, reared from leaf-mines of Pipturus.

Gracilaria sp. near *epibathra* and *dubautiella,* but specimens too poor for determination. Kamiloloa, 5 reared from leaf-mines of Raillardia.

Bedellia n. sp., Kamiloloa, 2 reared from leaf-mines of *Panicum nephelophilum.*

Cyane terpsichorella Busck, 1 Kamiloloa.

Hieroxestis omoscopa Meyrick, 1 Kamiloloa, larvae in rotten wood everywhere.

HEMIPTERA

Saldidae

Acanthia procellaris Kirkaldy, 1 Kawela.

Miridae

Tichorhinus sp., 1 Kawela, 1 Kamiloloa on Pipturus.

Tichorhinus sp., 8 Kamiloloa, on Coprosma.

Mirid (?), 1 Kamiloloa, on Pipturus.

Mirid (?), 1 Kawela, host not recorded.

Hyalopeplus pellucidus (Stal), 1 Kawela, 2 Kamiloloa, on Pipturus and Coprosma.

Nabidae

Reduviolus capsiformis (Germ.), 2 Kamiloloa, on Bermuda grass.

Reduviolus lusciosus (White), 1 Kawela, 2 Kamiloloa, on Pipturus.

Reduviolus blackburni (White), 11 Kawela, on Lythrum and ferns.

Reduviolus subrufus (White), 1 Waikolu.

Reduviidae

Ploiaria sp., 1 in McVeigh cabin.

Myodochidae

Orthoea nigriceps (Dallas), 1 Kamiloloa, on Coprosma; 1 Waikolu; 7 Kawela, on Lythrum.

Nesocymus calvus (White), 2 Kawela; 1 Kamiloloa, on Pipturus.

Nysius sp., Kawela, 6 on Lythrum.

Nysius sp., Kawela, 5 on Lyhtrum.

Nysius sp., Kawela, 1 on Metrosideros.

Nysius sp., 4 species, 9 specimens, host not recorded; Kawela and Waikolu.

Pentatomidae

Oechalia grisea (Burm.), 3 Kawela, 1 Kamiloloa, 2 Waikolu on ferns.

Scutelleridae

Coleotichus blackburniae (White), Kaunakakai, 2,500 feet, 6 adults and many larvae on *Dodonaea viscosa*.

HOMOPTERA

Cicadellidae

Phrynomorphus hospes (Kirkaldy), 9 Kamiloloa, on Bermuda grass.

Nesophrosyne ponapona Kirkaldy, 40 Kamiloloa, on Pipturus, 1 Kaunakakai, 2,000 feet.

Nesophrosyne sp., 1 Kaunakakai 2,400 feet, on Dodonaea.

Nesophrosyne sp,. 11 Kamiloloa, on Coprosma, 1 Kawela.

Nesophrosyne sp., 2 Kamiloloa, 1 pair on Coprosma.
Nesophrosyne sp., 6 Kawela, on Sadleria and other ferns.
Nesophrosyne sp., 1 Kamiloloa, host not recorded.
Nesophrosyne sp., 3 Waikolu, host not recorded.
Nesophrosyne sp., 2 Kawela, host not recorded.

Flatidae

Siphanta acuta (Walker), common everywhere on most trees and shrubs.

Cixiidae

Oliarus kahavalu Kirkaldy, 2 Kamiloloa, 1 on Metrosideros, 1 at light.

Oliarus euphorbiae Giffard (or near it), 1 Kawela.

Oliarus n. sp. near *kaonohi*, 32 Kawela, on ferns, 2 Waikolu, on ferns.

Delphacidae

Leialoha probably *mauiensis* Muir, 3 Kamiloloa, on Metrosideros, 3 Waikolu, 4 Kawela.

Leialoha sp., 5 Kamiloloa, on Coprosma.

Ilburnia ipomoeicola (Kirkaldy), 12 Kawela, on Lythrum.

Ilburnia n. sp. (?), 30 Kamiloloa, on Pipturus.

Ilburnia n. sp. (?), 11 Kawela, on ferns.

Ilburnia sp. 2 Waikolu, on Gouldia.

Ilburnia sp. (nymph only), 1 Waikolu, on Astelia.

Psyllidae (see page 423)

Trioza molokaiensis Crawford, 20 Kamiloloa, on Coprosma (?), 2 Kawela, on Metrosideros.

Trioza lanaiensis Crawford, 3 Kawela, on Metrosideros.

Kuwayama nigricapita Crawford, 1 Kawela, on Metrosideros.

Kuwayama gracilis Crawford, 3 Kawela, on Metrosideros; 5 Kamiloloa, on Coprosma and Pipturus (probably only accidentally). One had abnormal venation of right wing.

Pauropephala sp., 1 Kamiloloa, on pokeweed.

Aphididae

Aphis, 3 undetermined specimens, Kawela and Waikolu, 1 on Metrosideros.

Aphis, observed on Lysimachia, Kawela, but not collected.

Coccidae

Nesococcus pipturi Ehrhorn, 1 Kamiloloa, on Pipturus.

CORRODENTIA

Psocidae

Psocus distinguendus Perkins, 1 Kamiloloa, on Coprosma.

Elipsocus inconstans Perkins, 1 Waikolu, 2 Kawela.

ODONATA

Libellulidae

Nesogonia blackburni McLachlan, 1 Kawela.

Agrionidae

Agrion blackburni (McLachlan), 2 Kawela.

Agrion sp., 3 Kawela.

NEUROPTERA

Hemerobiidae

Nesomicromus brunnescens Perkins, 3 Kawela, 1 Waikolu.

ORTHOPTERA

Blattidae

Allacta similis (Sauss.), 7 Waikolu, 6 Kawela, 1 McVeigh's cabin.

Blatella germanica (Linn.), 1 McVeigh's cabin.

Tettigoniidae

Elimaea punctifera (Walker), 1 Kaunakakai, 2,500 feet.

Conocephalus saltator (Sauss.), 2 Kamiloloa; abundant in grass.

Banza molokaiensis Perkins (?), 2 nymphs, Kawela and Waikolu.

Gryllidae

Paratrigonidium atroferrugineum Brunner, 16 Kawela, on Metrosideros, 2 Waikolu.

Paratrigonidium molokaiense Perkins (?), 2 Kawela, on ferns, 1 Waikolu.

Gryllus oceanicus Le Guillou, 1 Kawela.

DERMAPTERA

Labiduridae

Euborellia annulipes (Lucas), 2 McVeigh's cabin, 2 Kawela.

SIPHONAPTERA

Ctenocephalus felis (Bouché), 1 on rat at McVeigh's cabin.

Psyllidae of Molokai.

BY D. L. CRAWFORD

A small collection of Psyllidae (Chermidae) was submitted by O. H. Swezey as a result of a recent visit to Molokai. As one would expect, because of the proximity of this island to others, there are no outstandingly distinct species, but there appear to be some local differentiations because of the isolation, just as on the other islands.

Trioza molokaiensis n. sp.

This species is very close to *T. ohiacola*, of which it is perhaps a derivative. It also seems to resemble *T. lanaiensis* rather closely. It differs from *T. ohiacola* chiefly in having longer genal cones, about as long as vertex, while the older species has short cones.

The average size is a little larger than *T. ohiacola* and the color of body is somewhat lighter, although there are some individual specimens that are quite as dark as the older species. The wing venation is practically identical with *T. ohiacola*, but the costal margin has a fringe of short setae. The venation is different in minor respects from that of *T. lanaiensis*.

Genitalia of both sexes are essentially like *T. ohiacola*.

Described from many specimens of both sexes collected by O. H. Swezey at Kamiloloa, Molokai, December 20, 1925, on Coprosma (uncertainty as regards record of host plant), at an elevation of 3,200 feet above sea level; one specimen at same locality on Metrosideros. Two specimens by E. H. Bryan, at Kawela, elevation 3,700 feet, December 23, 1925.

Trioza lanaiensis Crawford.

This species appears to be present on Molokai, represented in this collection by several specimens taken by E. H. Bryan, at Kawela, elevation 3,700 feet, on Metrosideros, December 23, 1925.

Kuwayama nigrocapita Crawford.

A single specimen of this Hawaii and Lanai species was taken by E. H. Bryan, at Kawela, Molokai, 3,700 feet, on Metrosideros.

Kuwayama gracilis Crawford.

This pretty species is well represented by several specimens essentially like the Oahu specimens available for comparison. This species has been previously reported from Molokai. In this collection two localities are represented: Kamiloloa, December 20, 1925, on Coprosma (O. H. Swezey); and Kawela, December 23, 1925, on Metrosideros (E. H. Bryan).

Paurocephala sp.

One specimen of this tropical genus was taken by E. H. Bryan at Kamiloloa, December 20, 1925, on pokeweed, but the antennae are lacking and I hesitate to make a new species for this, which probably will be necessary on examination of more specimens. This is the first occurence of this interesting genus in the Hawaiian Islands.

Notes on the Habits of the Bees and Wasps of the Hawaiian Islands.

BY FRANCIS X. WILLIAMS.

(Presented at the meeting of October 7, 1926.)

While the endemic insect fauna of the Hawaiian Islands is of remarkable interest, it may not at first appeal to the visiting entomologist who is unacquainted with its nature, for here he will find neither large nor showy insects in abundance, nor will native species usually be taken in sufficient numbers and variety to represent a respectable day's catch. Some orders of insects are totally unrepresented in the Archipelago, even by introduced species, while smaller groups, such as genera, may together present a very unbalanced condition, in that they contain a comparatively large or a comparatively small number of species. The Hawaiian bees and wasps exemplify this condition very well; in the bees the large endemic genus *Nesoprosopis* contains over 50 species; in the world-wide genus *Megachile* (leaf-cutting bees) there are but five species, of which two are very doubtfully peculiar to the Archipelago; while in the wasps, the genus *Odynerus* has more than 100 native species, a number that considering the small area which these occupy probably far surpasses that of any region of comparable size on the globe; the genus *Crabro* is represented by about twenty, with *Nesomimesa* and *Deinomimesa* containing five each; while in the native Bethylidae, the genus *Sierola*, composed of tiny, blackish wasps, has 171 described forms, with many more yet to be discovered; on the other hand the immigrant bees and wasps, such as *Xylocopa*, *Lithurgus*, *Sceliphron*, *Trypoxylon*, *Pison*, and *Anoplius* have, as is to be expected, very few species, from one to three per genus.

Considerable work has been done on the Hawaiian Aculeates both from a systematic and a biologic standpoint, and for which we are indebted mainly to Dr. R. C. L. Perkins, who for many years collected and studied insects in the Archipelago and whose

very excellent treatises are to be found for the most part in the Fauna Hawaiiensis, and Proceedings of the Hawiaian Entomological Society; among other workers who have contributed to the knowledge of Hawaiian bees and wasps, are Giffard, Swezey, Bridwell, Fullaway and Timberlake, and whose papers are published chiefly in the local entomological journal. From these sources, then, and from the author's own observations have been derived the data which follow.

In a manner that is somewhat comparable to a native race in its decline before the advance of a more aggressive and enterprising people, the Hawaiian bees and wasps—among other endemic insects—in many cases are losing their foothold because of the inroads of man and introduced animals and insects upon those natural conditions to which they are most often so closely adapted; thus we find that the immigrant ant, *Phidole megacephala* (Fab.) now ubiquitous in the lowlands to some altitude in the mountains, has in many places seriously affected the nice biological balance that once existed among the endemic insects there. There are, of course, more natural checks on the increase of the native insect population, such as occasional bad years when food is scarce, excessive cloudiness and moisture—as prevail in many of the mountainous regions—that serve to shorten the working hours of these Hymenoptera and to favor the growth of fungi that often destroy in their early stages great numbers of Aculeates; then, too, there are insect parasites and predators, and among the former are many Encyrtid and other Chalcidoid wasps.

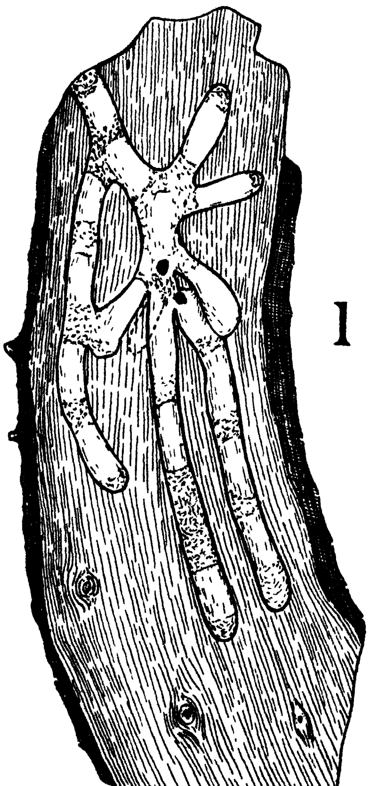
While there are a number of native bees and wasps that seem to flourish equally well in the lowlands and in the uplands, the majority are quite restricted in their habitat and are to some extent distinguished by a peculiar facies—thus among the *Odyneri* on the island of Oahu, the red-marked species are entirely mountain-inhabiting, while those marked with whitish or pale yellow are almost always coastwise forms, with black species in both environments. This distinction does not hold true on the other islands, and on the island of Kauai there are a number of white-banded species that occur in the mountains.

The coast lands, at least on the leeward side of the islands, have a light rainfall which is seasonal in its character; this

freshens up the vegetation and awakens the insect life there for a brief period, following which the region resumes its semi-desert aspect. In the humid mountains there is, with some variation in intensity, a continuous round of seasons, so that bees and wasps and other insects are to be had there throughout the year. In the lowlands, bees and wasps more usually dig holes in the ground or nest in little hollows in lava, but in the uplands, old beetle borings in trees or hollow twigs are preferred. With the exception of one or two wasps, none of the native Aculeates exhibits much architectural ability in the construction of its nest.

BEES

The bees of the genus *Nesoprosopis* Perkins (Hylaeidae) are classified in the group *Obtusilingues*, in which the tongue is short, with the tip split or broad. They are of small size, prevailingly black in color, more rarely in part reddish, and frequently marked with yellow or white. The mother bee has relieved her offspring of the work of spinning a cocoon, for she has been found to line the cell as a cocoon with a filmlike substance. "The larval food contains comparatively little pollen, as these bees have no special pollinigerous apparatus, and in the cells that I have opened the larva was floating on the liquid food" (Perkins, Fauna Hawaiiensis, I, p. 76, 1899). The bees favor many kinds of flowers but are always abundant on those of Ohia Lehua (*Metrosideros polymorpha* Gaud.), *Myoporum sandwicense* Gray, and *Scaevola* spp., and I have noticed on the latter plant that while the introduced honey bee *Apis mellifera* Linn. with its longer tongue is satisfied to draw nectar from the base of the well-cleft mature flowers, *Nesoprosopis* will search the bush until she finds a blossom that is just beginning to open and that thus probably offers her more available nectar. The nests are often well removed from the feeding grounds. Fig. 1 shows a large nest of a black species from Kilauea, Hawaii, the bee having mined the decayed wood of a *Metrosideros* branch; 18 cells are visible. *Nesoprosopis anomala* Perkins, a handsome, somewhat rare bee with black, red and yellow markings, has several times been reared from its cells in the pith cavity of dead *Pipturus* and *Boehmeria* twigs. It patronizes the flowers or nectar glands of *Acacia koa*.



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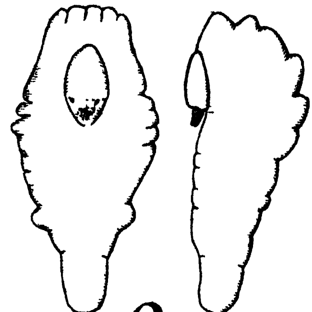

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Fig. 1. Nest of *Nesoprosopis pubescens* P. in decayed wood of Ohia lehua (*Metrosideros polymorpha*), Kilauea, Hawaii, 4,000 feet. November, 1919.

Fig. 2. *Nesomimesa antennata;* resting larva. Manoa, Honolulu.

Fig. 3. *Nesomimesa antennata;* cocoon. Manoa, Honolulu.

"The females of all the parasitic species but one have the abdomen ferruginous at least at the base, but in two species the males are black or nearly so" (Perkins, l. c., p. 77). This condition recalls the genus *Sphecodes* of the nearctic and palaearctic regions also with a red or red and black abdomen, and that in some instances at least has proven parasitic upon genera related to it.

Probably a number of *Nesoprosopis* are parasitized in the cocoon stage by Chalcidoid wasps; Perkins (Fauna Hawaiiensis, Vol. II, Pt VI, Supplement, P. 631, 1910.) speaks of *Eupelmus* as parasitizing bees of the genus *Prosopis*, and *Eupelmus cupripes* Perkins, has been reared by Giffard from the cells of a *Nesoprosopis* taken on Tantalus, Oahu, in 1906 and 1906. *Nesencyrtus kaalae* (Ashm.) has been found as a parasite upon the larva of *Nesoprosopis pubescens* Perk at Kilauea, Hawaii, (Timberlake, Proc Haw. Ent. Soc. IV, 185 and 224-225, 1919.)

Recently (Bull. 31, Bishop Mus., p. 22-23, 1926) Timberlake described *Nesoprosopis perkinsiana*, a bee that occurs on the islet of Nihoa, about 120 miles W. N. W. of Kauai.

The rest of the bees found in Hawaii belong to the *Acutilingues*, or those that are provided with a pointed tongue Most if not all of these are exotic. The largest and often the most conspicuous of the lot is the burly, inch-long "Carpenter bee," *Xylocopa varipuncta* Patton (see Timberlake, Proc. Haw. Ent. Soc. V, p. 51, 1922, for the identity of this insect), that is often heard before sunrise buzzing loudly among the blossoms of the "Golden Shower" (*Cassia fistula* Linn.), an ornamental leguminous tree extensively planted in Honolulu and elsewhere in the islands. The bee is an immigrant of many years standing from Southwestern United States and is now widespread on the lowlands of the Archipelago, not usually venturing very far into the mountains. The female is jet black with dark iridescent wings, while the male is tawny brownish-yellow with the wings transparent. It is often referred to among the laity as the "bumble-bee," but apart from the black color of the female, 'often strongly dusted on the head and thorax with yellow pollen, the size and the buzz, it has little in common with the more hairy social insect that defends its nest in the ground with such vigor,

and of which we have none in the Hawaiian Islands. *Xylocopa* tunnels many kinds of dead wood and seems especially fond of redwood (*Sequoia*) posts and the dead trunks of the "Hau" (*Paritium tiliaceum* St. Hil.) and of "Avocado" (*Persea americana* Mill.). The cylindrical borings are used over and over again and new ones made so that the affected wood is often reduced to a mere shell and the bee has thereby come to be regarded as somewhat of a pest.* The tunnels are about 2/3 of an inch in diameter and except for the entrant part and the connections, are usually made parallel to the grain of the wood; they may be over a foot in length, with the cells about 3/4 of an inch long provisioned with pollen and regurgitated honey and partitioned with a paste of wood dust. No cocoon is spun; the pupae are very stout and at first pallid. From field observations one might conclude that females are produced far in excess of males; dissection of bored timber however, reveals the two sexes in fairly equal numbers. Besides, the males, which buzz in a higher key than the females are not usually to be found at large in company with the latter but may be seen poising and darting back and forth near trees and over shrubbery, doubtless in the vicinity of a nest. A post heavily bored by these bees will, when struck a sharp blow, resound with the buzzing of the startled inmates. One may remove an infested piece of wood to another locality and the progeny of bees will continue using the tunnels.

The female collects food materials for her cells from a number of flowers, as various morning-glories (*Convolvulaceae*), *Hibiscus*, *Cassia*, *Passiflora*, etc., and it is interesting to watch one of these bees at work in the early morning on *Convolvulus*

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*An injurious carpenter bee in India is the large blue and green *Xylocopa latipes* (Drury) that tunnels several kinds of woods and "occasionally causing serious damage to the rafters of the tea factories and other buildings," (Stebbing, E. P., Journ. Bombay Nat. Hist. Soc. XVI, 668, 1905). Despite the injurious nature of the work of *Xylocopa* they are meritorious as assiduous pollinators of flowers. To quote Maxwell Lefroy in "Indian Insect Life," 1909, under "Insects and Flowers in India," by I. H. Burkill: "The *Xylocopas* are the most important of flower-visiting insects in the plains of India, and are of very general distribution. They have large eyes and long tongues, and they visit persistently all day, and some of them also on moon-lit nights. The Sunn hemp crop is largely fertilized by them, and possibly the Indian pulses. Cassias in Calculatta are commonly visited by one of them and many large, showy flowers."

blossoms, often flying at first directly before the flaring tube, then as if realizing that her own bulk is far too large to penetrate these narrow depths, she flies over the top and to the base of the flower, where the latter is readily punctured and the desired nectar secured.

While this bee is frequently well laden with acari (mites), it lacks the acarid chamber, a pouch opening on the anterior face of the first abdominal segment, common to *Mesotrichia*, a subgenus of *Xylocopa* of the old world, and to some Eumenid wasps (Bequaert; Vespidae of the Belgian Congo, Bull. Amer. Mus. Nat. His. XXXIX, p. 104, 1918.). Perkins (Proc. Haw. Ent. Soc. I, p. 28-29, 1906)' has observed this acarid chamber on some carpenter bees from India, also in a Mexican *Odynerus*, and on an Australian wasp, where the cavity was located in the posterior face of the propodeum,

Xylocopa varipuncta holds its own very well against *Phidole megacephala*, the dominant ant of the low and middle elevations of Hawaii and probably its chief enemy, for while these ants do invade the nests and carry off the immature stages, the bee's squeaky buzzing within the tunnels seem to deter their attacks somewhat; at any rate, the colonies usually persist for a long time.

Among the hymenopterous parasites of *Xylocopa* spp. may be mentioned tiny wasps of the family Encyrtidae, that entirely fill the body of the bee larva (see letter of Kunhi Kannan of India to Prof. Poulton in Trans. Ent. Soc. London, 1925, p. xii-xiii,); while *Polychrum repandum* Spinola, one of the Sapygidae, a family related to the Scoliid wasps, is a parasite in the cells of *Xylocopa violacea* L. in the south of Europe (see Parker, H., Boll. Lab. Zool. Generale e Agraria, Portici, XVIII, 268-270, 6 figures).

In some parts of the world, Cantharid beetles parasitize the larvae of the Carpenter bee (*Xylocopa*), and of bees belonging to the genus *Anthophora*, gaining entrance to the nest in the first or triungulin stage by clinging to their huge winged hosts which carry them homewards. This parasitization was noted long ago by Fabre (Ann. Sci. Nat. Zool. Ser. IV, Vol. VII, 1857, pl. 17) in the case of *Anthophora* by *Sitaris humeralis* in Europe.

In both Africa and India, large "robber flies" (Asilidae) of the genus *Hyperechia*, that much resemble different *Xylocopa* species and that are sometimes held as examples of "aggressive mimicry" in relation to these bees, devour the latter and other smaller Hymenoptera, while the larvae of these *Hyperechia* tunnel in wood containing the cells of *Xylocopid* bees and feed upon their young (see Poulton, E. B., Trans. Ent. Soc. London, 1924, p. 121-133, Pl. XI, and Proc. Ent. Soc. London, 1925, pp. XII-XIII, Pls. B and C; also Proc. Ent. Soc. Lond., I, 1-2, 1926, and 44-47, 1927).

Xylocopa orpifex Smith has been studied by Davidson (Ent. News, 4, pp. 151-153, 1893) and by Ninnger (Pomona Coll. Journ. Ent. and Zool. VIII, pp. 158-168, Pls. 1 and 2, 1916) in Southern California. Davidson found the Bombyliid fly (*Argyramoeba simson* Fab.) heavily parasitizing this bee in the larval stage, and the Chalcid wasp *Monodontomerus montivagus* Ashm. also parasitic upon it. Nininger, who published more at length upon *orpifex*, ascertained that the bee tunnels wood (choosing sound wood) very slowly, in one case less than an inch was excavated at the end of six days. The latter author describes the life history of *Spogostylum delila* Loew., another of its Bombyliid parasites which he found one season infesting about 10 per cent of the bee's cells. He also mentions the Tenebrionid beetle (*Aphanotus brevicornis* Lec.) and a Phycitid moth as feeding on the bee bread, and when this was consumed, upon the young of the bee. *Xylocopa varipuncta* as occuring in Southern California, was found by Nininger to have a life cycle of slightly over 3 months. The mite of the genus *Trichotarsus* was found to destroy a small percentage of the larvae and also to infest the adults.

Lithurgus albofimbriatus Sich.

This is a very swift black bee related to the leaf-cutters (*Megachile*). It was originally described from Tahiti (Sichel, Reise d. Novara, Zool. II, p. 1, 1867, Hymen. p. 151, ♀.) and is known also from Suva, Fiji. It is a comparatively recent immigrant, the first specimen having been taken in about 1900 (Perkins, Proc. Haw. Ent. Soc. I, p. 112, 1906) at Waialua, Oahu; it is now widely distributed in the lowlands of that

island and has boring habits rather similar to *Xylocopa*. The first record of its nesting habits in the Archipelago was made by Mr. Swezey (Proc. Haw. Ent Soc. III, p. 98, 1915), who found a nest in the pithy base of a dead date-palm leaf on Coconut Island, Kaneohe Bay, Oahu. It is not infrequently associated with *Xyclocopa*, in that it may share the same post for its tunnels, even entering by those of the larger bee, as noted by Illingworth (l. c. 140, 1915). It feeds at flowers of several kinds, including morning-glories (Bridwell, l. c. p. 288), and is also fond of the blossoms of *Hibiscus mutabilis*, an ornamental *Malvaceae*, visiting these in a very hurried manner so that one must be quick to catch it.

There are five species of the genus *Megachile* in the islands, mainly lowland insects that with the exception of the very common urban *M. schauinslandi* Alfken (1898), make cells of leaf and petal discs.

Megachile palmarum Perk. is sometimes "seriously destructive to many shade and ornamental plants about Honolulu" (Perkins, Proc Haw. Ent. Soc. I, 85, 1906). Perkins (l. c) found the common grain and flour beetle, *Tribolium ferrugineum* (Fabr.) to be an enemy of this bee in its cells. The little Chalcid, *Melittobia hawaiiensis* Perkins, is parasitic on at least one species of *Megachile* in Hawaii. *M. schauinslandi* is very abundant in Honolulu; it is blackish with a band of rich brown across the body; it may often be seen busily inspecting holes in electric power poles, in woodwork, etc., in which to make its nest, partitioning off a suitable hollow and finally sealing it up with a resinous material. It occurs on several of the islands and is also known from China and India.

Two of the four typical *Megachile* have proven of exotic origin.

While bees of the genus *Megachile* are an occasional nuisance by their partial defoliation of plants and by building nests in keyholes, etc., they are important pollinators of flowers of useful plants (see Sladen, Pollination of Alfalfa by Bees of the Genus Megachile, Can. Ent. 50, pp. 301-304, 1918) and though occurring as a rule, in fewer numbers than the honey bee (Apis) are far more active and energetic than the latter.

A very readable account of the life-history of a leaf-cutter bee (*Megachile decipiens,* a large species of the eastern United States) has been written by E. G. Reinhard, in "Hobbies," VI, No. 9, March, 1926, (published by the Buffalo Society of Natural Sciences).

For a treatise on the species occurring in Hawaii, see Timberlake in Proc. Haw. Ent. Soc. IV, p. 551-557, 1921.

The common hive bee, *Apis mellifera* Linn., has been introduced into the Hawaiian Islands, where it is kept under domestication, and has also escaped to the mountains and nests there in hollow trees and suitable crevices between lava. It is a very hardy insect and in some places far outnumbers the native bees at such flowers (or nectar glands) as those of *Acacia koa*, the Algaroba (*Prosopis juliflora*), the Ohia lehua (*Metrosideros polymorpha*), and *Scaevola*, being the last to disappear therefrom upon the approach of unseasonable weather. The bee-moth, *Meliphora grisella* Fab., whose larva eats the wax of the combs, has followed it into the wilderness.

WASPS

Sphegidae

Sceliphron caementarium (Drury).

This thread-waisted wasp is an immigrant from the United States and is now abundant on the principal islands of the Archipelago. Of this insect, Swezey (Proc. Haw. Ent. Soc. I, 16, 1906) says, in part, referring to a collecting trip in February and March to the island of Hawaii: "No adults were seen but the nests of this mud-dauber wasp were common, and they always contained larvae or pupae, which shows that this species is continuing the habit of hibernation which it had in the States, where it hibernates as larvae in the cells of its mud-nest."

While it seems to prefer the lowlands, its mud cells are often found to an altitude of at least 2,000 feet plastered against the rocky banks alongside the mountain trails of Oahu. As is well known it stores spiders in its cells, and if one of the latter cannot be filled before late afternoon it is plugged with a thin mud disc, which on the following morning is removed, the storing

completed, and the cell plugged with a thick permanent mud wad. This has previously been observed by Dutt (Mem. Dept. Agric. India IV, 203, 1912) with *S. madraspatanum* in India.

Sceliphron is parasitized* in its early stages by *Chrysis (Pentachrysis) extraniens* Rohwer, (Chrysididae), a Cuckoo-wasp of a brilliant blue or green color first discovered in the Islands in 1914, on Oahu, and described by Rohwer in Proc. Haw. Ent. Soc., V, p 67-69, 1922. The tiny Chalcid wasp *Melittobia hawaiiensis* Perk. also parasitizes the larva of this mud-dauber, as it does that of several other wasps (see Swezey, Proc. Haw. Ent. Soc. I, 121-123, 1907). Recently (Dec., 1926) Swezey found the *Chrysis* parasitized in the cocoon stage by this *Melittobia.* Many spider-stored cells fail to produce adult *Sceliphron.*

PEMPHREDONIDAE

Stigmus inordinatus Fox.

Perkins (Fauna Hawaiiensis, Vol. II, Pt. VI, Supplement, p. 605, 1910) records one specimen having been taken in Honolulu. None has been found here since. The species of *Stigmus* are very small blackish insects that provision their nests in hollow brambles, etc, with Aphids (plant lice).

MIMESIDAE

Here occur two endemic genera *Nesomimesa* and *Deinomimesa*, each represented by five species, all slender, black forest-loving insects that usually tunnel in the ground, but have occasionally been seen entering burrows in dead trees (Perkins, Fauna Hawaiiensis, I, 8, 1899).** Perkins (l. c.) further states that the prey of these island species so far as known consists entirely of Tipulidae (Diptera). This habit of catching flies seems unusual however, among such wasps in view of the fact that at least several continental Mimesidae prey upon Homopterous bugs, while subsequent observations in the Hawaiian Islands point to this group of insects as being the normal host for the wasp, which is often seen examining ferns, *Pipturus* and other plants for bugs.

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* Or perhaps the *Chrysis* grub devours some of the stored spiders.

** Bridwell (Proc. Haw. Ent. Soc. III, 275, 1917) found *N. antennata* nesting in dead *Erigeron* stems.

Nesomimesa antennata (Smith) is widespread on the uplands of Oahu and has been taken on the summit of Konahuanui, the highest peak in the Koolau range. Swezey, and later Bridwell, have observed this wasp preying upon native leafhoppers of the Cixiid genus *Oliarus*. The males are often so numerous as to fairly swarm, even in drizzling weather, over the Staghorn ferns (*Gleichenia dichotoma* Hook.) that in many places cover large areas on the mountain slopes; the females are far less in evidence, for they are generally engaged in nesting activities. I have found their burrows, that are steep and several inches deep, at the upper end of Manoa Valley, at an altitude of about 1,400 feet. The wasps nest in small colonies in the rich soil that is more or less covered with dead and living ferns and which thus somewhat conceal the little heaps of earth that mark each burrow; the latter is often difficult to follow inasmuch as it penetrates among many fine rootlets. Probably each burrow has several cells; these are stored sometimes with more than one species of *Oliarus*, and also with the larger Australian *Siphanta acuta* (Walk.) (*Pockillopterinae*), a triangular green insect that when mature suggests a very large and awkward burden for the slender wasp; the prey is not killed but paralyzed almost to immobility, so that the tender grub may feed safely upon it; the full-fed wasp grub has an elongate, medium-sized head with distinct antennal cornicles and with the body mostly clothed with quite short, erect hair. When kept under dry conditions, which may happen in nature, the grub occasionally shrinks somewhat so that it assumes a rather hunched position with the head resting upon the breast (Fig. 2).

Nesomimesa hawaiiensis Perkins occurs at suitable elevations on Hawaii and has habits comparable to those of its Oahuan relative. At Pahala, where sugar cane is grown to a maximum elevation of about 3,000 feet, and where some years ago it suffered from an epidemic of the foreign sugar-cane leafhopper, *Perkinsiella saccharicida* Kirk. (Delphacidae), this wasp left its mountain home to prey extensively on the pest, and which it did, in many cases at least, to the exclusion of other species of leafhoppers. A small colony of these wasps nested in a bank at an elevation of about 1,850 feet, and their tunnels terminated in several cells. The rather loosely-made cocoons are usually spun

among the remains of the leafhoppers. (Fig. 3, for *N. antennata.*) The parasitic flies of the genus *Pipunculus* also profited by this excess of leafhoppers; years later, however, the introduced *Perkinsiella* enemies so prevailed as to reduce it almost to the vanishing point and both *Nesominesa* and *Pipunculus* were forced to operate above the plantation, eking out a more difficult existence among the ferns and native trees that harbored their comparatively scarce natural prey.

The habits of *Dinomimesa haleakalae* Perk. have to some extent been observed by Timberlake (Proc. Haw. Ent. Soc. IV, 330, 1920) on Mt. Haleakala, Maui, at an elevation of about 5,000 feet. The wasp stores both immature and adults of the Jassid genus *Nesophrosyne*, in their horizontal burrows dug in low banks along the trail.

Trypoxylonidae

The two species of *Trypoxylon*, slender red and black insects, as well as the three *Pison* are not endemic to the Hawaiian Archipelago. None has been in the islands very long, though the fact that they may be domiciliary in their native country, using any convenient hollow for a nidus and storing such cosmopolitan prey as spiders, makes their presence here very normal.

Trypoxylon bicolor Sm. an Oriental species, first made its appearance at Hilo, on the island of Hawaii, between 1897 and 1900 (see Perkins, Fauna Hawaiiensis II, 606, 1910). On the island of Oahu, it is more likely to be found in the mountains, where it commonly nests in hollow twigs, old beetle borings, etc., partitioning off generous cells with dish-shaped discs of mud. It also nests in furniture, as noted by Perkins, thus accounting probably for its distribution to the other islands. The cocoon of this and of the following smaller species is slender and of delicate texture with the rounded base darkened and stiffened by the larval meconium. The cocoons are sometimes parasitized by the tiny Chalcid, *Melittobia hawaiiensis* Perkins.

Trypoxylon philippinensis Ashm. is a later arrival to the Archipelago than *bicolor*, though now well distributed. It seems more of a household insect than the latter, making its nest in

odd places, as glass tubes, in the folds of pamphlets, etc.; more normally it utilizes hollow twigs, and so the trimmed hedge of the Night-Blooming Cereus *Hylocereus undatus* (Haworth) offers many such nesting places in its dried and more or less pith-free stems.

Interesting studies have been made in the genus *Trypoxylon*. Glass tubes have been substituted for hollow twigs (Howes, in Tropical Wild Life in British Guiana, 1917,) so that their habits could be studied more readily. In certain species the male guards the entrance to the nest while the female is out foraging.

Pison hospes Sm., the largest of the three species, occurs also in Australia, in Samoa and in Fiji. While often abundant about houses it is not uncommon at middle elevations in the mountains, sometimes modifying old *Sceliphron* nests on rocky banks to suit its need. *Pison iridipennis* Smith is common about Honolulu and has been found nesting in the old twig tips of the Night-Blooming Cereus; it is reported from Australia and also occurs in the Philippines. *Pison argentatum* Shuck. has a very great range, inhabiting Africa, Madagascar, Mauritius, the Philippines, and probably elsewhere on the continents. It makes dainty little cells of mud, fitting them in some angle or corner. The larvae of the three species form a stiff cask-like cocoon of fine particles of clay. The Chalcid wasp *Melittobia hawaiiensis* parasitizes the young of *Pison*.

A key for determining the three species of *Pison* in Hawaii has been published by Bridwell (Proc. Haw. Ent. Soc. IV, 123, 1919.)

LARRIDAE

Notogonidea subtessellata (Smith); (= *N. luzonensis* Rohwer), one of the commonest and most widespread Philippine Larrids, was introduced, as a few cocoons, in Honolulu in 1921. Being a very active insect with plenty of its larval food, *Gryllus* crickets present, it soon became established and later spread of itself to the major islands of the group. It is now a familiar insect in some of the cane fields of the islands and along the more open forest trails at rather low elevation. It is treated more in detail in Bull. 14, Ent. Ser. 137-138, 1919, of the Experiment station, H. S. P. A. (=*Notogonidea luzonensis* Roh.)

Larra luzonensis Rohwer.

This is a polished black wasp with red hind femora, that measures about 13 millimeters in length. It is not to be confused with the field-cricket wasp, *Notogonidea subtesselata*, just referred to and that is a distinctly more active Larrid of nearly similar size but more grey black, with the legs and head all blackish. *Larra luzonensis*, the mole-cricket parasite, was introduced from the Philippines by Pemberton in June and July, 1925; and on September 3, 1926, it was found abundantly—for its type of wasp—in parts of the Waialua Agricultural Company and Ewa Plantation Company, Oahu, where it had been liberated. On October 3, a single female was observed on a screen window of one of the beach hotels in Honolulu and it was probably one of the progeny of a Manoa Valley, Honolulu, liberation of 1925.

Late in the afternoon of October 25, one of the first few days whose cooling atmosphere heralded the coming of the tropical winter, I had occasion to climb the peak of Tantalus directly behind the city of Honolulu and 2,000 feet above sea level. The ascent, now that automobiles carry one over an excellent road to an altitude of about 1,650 feet, has by this route almost lost its power of drawing perspiration and is a matter of but a few minutes toil. At a quarter to five, with the sun's rays no longer on the moist, clayey foot-path where I was traveling, I noticed quite in the middle of it a half-grown mole cricket (*Gryllotalpa africana*) lying prone on the ground yet not having the appearance of being dead. In stooping to pick up the limp creature, a nearby buzz announcing the departure of *Larra luzonensis*, the perpetrator of the deed, was heard, and sure enough the wasp's pearly white egg was found glued mainly a little to one side of the mid-ventral line in the incision between the underside of the pro- and mesothorax. The cricket recovered its activity in a short time and was brought to the laboratory so that the wasp's development could be followed. To sum this up briefly: The egg hatched early on October 30; on the following day the larva's turgid and hardly segmented body had doubled in size; November 3, the grub seems to have moulted, for it is now well segmented and large enough to be visible from the upper side

of the *Gryllotalpa;* November 4, *Larra* is growing rapidly and its head appears to be inserted within the body of its host from under the prothoracic shield; the victim, which has eaten several times of a piece of sugar cane shoot and which up to now has been vigorously active, is (10 A. M.) slowing up, and when examined again at 3:00 o'clock in the afternoon lay dead and limp, with the wasp grub, its head freed, just completing the moult which brings it into the final, strongly segmented, tuberculate and chewing stage. The moult skin has receded as far back as the eighth segment and the operation has evidently exhausted the soft white larva which remains inactive for some time; at the end of half an hour or so it bestirs itself and attacks the defunct cricket with renewed zest, inserting the head at the old wound under the prothoracic shield, sucking up the remaining juice and tissues and finally devouring the harder parts to the extent that by the afternoon of November 5, only a mandible and a claw or two remain and the first weak silken strands for the cocoon have been spun. At 7:30 A. M., November 6, the larva had almost completely enclosed itself in a moist, oblong soil cocoon, there remaining but a pin-hole at one extremity, while at the other the unfinished portion revealed a larger aperture at which the artisan could be seen at work. Before 9:00 A. M., the cocoon though very thin-walled, to all external appearances was completed; it lay in the earthen trough that I had made for it and was suspended by a number of silken threads in a cylinder of soil it had formed from the sides of this trough. Thus it is protected from excessive moisture. The cocoon remains soft and flexible for some time so that the grub's movements within can be followed; it is mouthed a good deal and very rapidly, and a portion often pulled in and pushed out again. Eventually it becomes hard and brittle, the main body remaining a dark earthy color, the cephalic end as a cap, resuming a much paler shade. It measured 14.5 millimeters in length and produced an adult female on December 14, making a life-cycle of 50 days.

On November 7, the wasp was found abundant on a small section of the Tantalus trail at the margin of a little wood, where the first parasitized mole cricket had been taken, and it also occurred to an elevation of at least 1,800 feet. On this

quiet sunny afternoon three immigrant aculeate wasps prevailed along the path; the nervously active *Anoplius luctuosus* seeking her spider prey, the glossy little cockroach hunter, *Dolichurus stantoni* hurrying over the ground in her darting gait, and *Larra luzonensis* less animated yet very alert, whether on the hunt or when sunning herself on a wooden step-rung of the pathway. This particular locality is evidently a chosen spot for mole crickets, of which three living specimens were found upon the surface of the ground; the first scarcely half grown was walking away in an unnaturally sluggish manner and an examination showed that it was but recovering from the sting of its enemy, for a *Larra* egg had been glued to its breast, the second cricket, a mature one, was obviously ill though not parasitized, while the third, also full grown, was making off in all haste as though fearing an attack; this one was cautiously placed near a *Larra*, that upon seeing it followed and finally pounced upon it, the twain thus unfortunately disappearing down a comparatively large burrow nearby.

On November 2, 1926, the first Hawaiian males of this species were secured, numbers occurring on *Scaevola* bushes at the head of Manoa Valley where they were sharing the scale-insect honey dew with *Apis mellifera*, *Polistes* and *Crabro* spp., and with their countrymen, *Notogonidea subtessellata*. Fewer female *Larra luzonensis* were seen there.

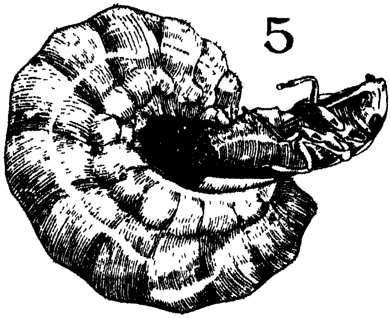
Fresh females of this wasp were taken January 15, 1927, at 1,800 feet on the Mt. Tantalus trail.

This insect seems to prefer the damper places, as the sides of irrigation ditches or recently watered areas where mole cricket (*Gryllotalpa africana* (Beauv.)) burrows are present. In such localities the superficial burrows of its prey are often perforated by a neat round hole oftentimes the work of *Larra* made in her subterranean search for her cricket victim. The wasp bids fair to be an efficient check of this occasional pest, as it has fewer enemies to contend with here than in the Philippines.

Silaon rohweri Bridwell.

This tiny and very active little wasp, described by Bridwell (Proc. Haw. Ent. Soc. IV, 398-400, 1920), is presumably an Ameri-

can immigrant into the Hawaiian Islands. It was discovered in 1919 by Bridwell at Waianae and at Ewa Coral Plain, Oahu, hot, arid districts that form habitats for wasps of this genus. Subsequently it was found in the City of Honolulu, and at Waimanalo, on the windward side, and in January, 1926, was taken at Lahaina, Maui, by Swezey. The wasp generally flies only a few inches above the ground, and so swift are its movements that it often escapes observation. It has a fondness for the flowers of a little mat-like *Euphorbia*. Bridwell, who first studied the life-history of this species, found it nesting in the borings of the *Cerambycid* beetle, *Neoclytarlus euphorbiae* Bridwell, in dead stems of an *Euphorbia* bush. The nests are stored with paralyzed nymphs of a Lygaeid bug of the genus *Nysius* that occurs plentifully on *Portulaca* or "purslane;" the cells being partitioned off with bits of coral, tiny shells, mud, dried leaves, and other odds and ends. The writer observed this Larrid nesting in a twig at Ewa Coral Plain, and in Cactus twigs in Honolulu. One nest contained 5 cells stored with a total of 17 bugs. The egg (Fig. 4) is laid more or less across the bug's breast, so that the end of the rostrum usually overlies it. It is slightly less than a millimeter long, and pearly, semi-transparent white. It hatches in less than 2 days; as far as could be ascertained the larva moults twice before pupation; the second moult shows it with the mandibles four-toothed, some fine short hairs upon its body, and with moderate lateral folds and thoracic tubercles. It is now in the chewing stage and more rapidly devours its prey (Fig. 5). In one instance observed, one of these grubs in consuming the strongly-pigmented eye of the bug became almost suddenly suffused with purplish. The cast skins of the larva form an adhesive mat upon which part of the body rests and help keep its seat upon the bug. Growing rapidly it chews up the greater part of each victim and in about a week's time from hatching begins spinning the tough typical larriform cocoon (Fig 6). Though working with steady, swift movements the building of this structure, strand by strand and grain by grain, is a slow operation. It forms the middle girdle which it augments from above and below, reversing itself frequently, at length, when the cask is nearing completion it may sometimes be seen with its head and thorax in the cocoon and ducking out



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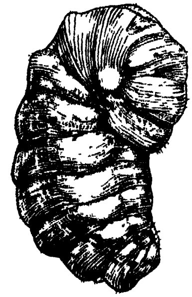

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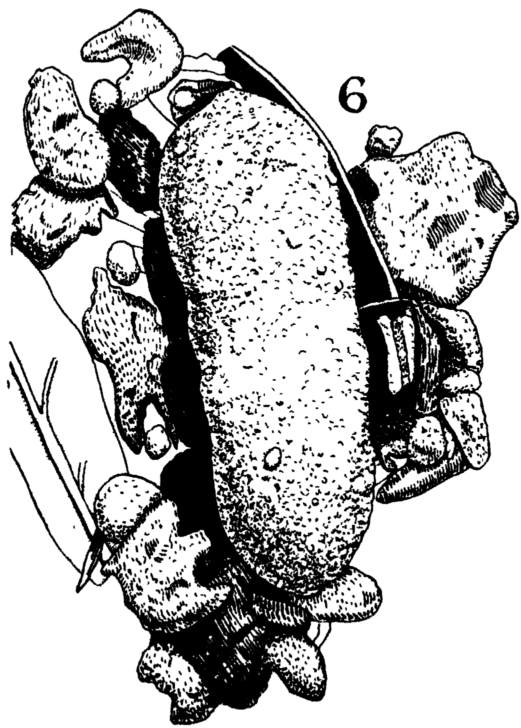

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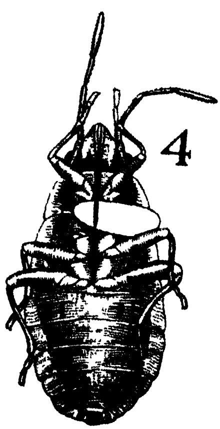

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Fig. 4. Nymph of Nysius bug bearing egg of *Silaon rohweri* on venter. Ewa Coral Plain, Oahu. March, 1920.

Fig. 5. Three-fourths grown (last stage) larva of *Silaon rohweri* and its food. Ewa Coral Plain, Oahu. March, 1920.

Fig. 6. *Silaon rohweri;* cocoon. Ewa Coral Plain, Oahu. March, 1920.

Fig. 7. *Silaon rohweri;* resting larva. Ewa Coral Plain, Oahu. 1920.

of sight, much as a person might stoop within a large barrel. Adults were not produced until more than two months after oviposition, for it was found upon dissection of a cocoon or two that the larvae passed through a short resting stage, remaining with the head and thorax curved into the body so that the head was quite invisible (Fig. 7). Metabolism must have been taking place very slowly in such larvae, as the pulsation of the dorsal vessel, in the single case then noted, was only 3 or 4 beats per minute.

CRABRONIDAE

The Hawaiian species all belong to the genus *Crabro*, in the wide meaning, and are large-headed, stoutly built little wasps, prevailingly black in color. They prey upon flies, and either burrow in the ground, as is the case with the dry-land forms, or else, as with others that inhabit the humid mountains, generally utilize beetle borings, etc., in timber, or even hollow twigs, or make their own borings in decaying branches and stems. The lowland *Crabro* have ants to contend with, while the mountain forms suffer much as nestlings from fungous diseases; but mould, even in dry regions often destroys the cell provender and hence the waspling.

At the present time with so many species of immigrant flies here, the prey of some of these wasps is very indiscriminate. Perkins (Fauna Hawaiiensis I, p. lxxxvi, 1913) states that: "Many of the species are extraordinarily numerous in individuals, and we have seen around a dead cow, on which flies were abundant, a swarm of one or two species of *Xenocrabro* almost as large as that of their prey." So also do species like *Xenocrabro unicolor* (Smith) (see Bridwell, Proc. Haw. Ent. Soc. IV, 331-332), and *Hylocrabro tumidoventris* prey to some extent on *Ceratitis capitata* Wied., the Mediterranean Fruit Fly. Greenbottle flies (*Lucilia*), flesh flies (*Sacrophaga*), and house flies (*Musca vicina* Macq.) are also commonly stored. At higher elevations in the native forest endemic Diptera are more likely to serve as the prey for these wasps, Perkins (l. c.) having found *Nesocrabro* carrying off native *Sarcophagid* flies of the genera *Dyscritomyia* and *Prosthetochaeta*. *Nesocrabro stygius* (Blkb. and Cam.) inhabits the mountains of Oahu, and while

usually perhaps forming cells in the ground, was once taken by Bridwell (Proc. Haw. Ent. Soc. III, 275, 1917,) nesting in fallen wood.

Nesocrabro compactus, var. *lanaiensis* Perk. has been found by Perkins to form its burrows "in trodden pathways and bare banks in the forest."

At Kilauea, Hawaii, elevation 4,000 feet, I have taken *Hylocrabro tumidoventris* (P.) var. *leucognathus* (P.) with a de-legged flies. *Xenocrabro hawaiiensis* (P.) has been observed by hood were searching earth banks—presumably for similar long-legged flies. *Xenocrabro hawaiiensis* (P.) has been observed by Swezey, at Kona, Hawaii, where it nested in a rotten log and provisioned its cells with *Sarcophaga pallinervis* Thoms., and Perkins (Fauna Hawaiiensis, Introduction, p. lxxxvi) has found this wasp preying, among other flies, upon the Limnobiid *Dicranomyia*. Of *Xenocrabro atripennis* (P.) Perkins says (l. c. p. lxxxvi), "Even the common housefly is not exempt, and at the Volcano-house hotel on Hawaii, *X. atripennis* has often been seen entering the rooms and taking the flies on the window panes." *Oreocrabro abnormis* (B. and C.) is rarely encountered; the first specimen, a male, was taken by Blackburn on Mt. Konahuanui, in the eighties, a very few were subsequently captured by Perkins, while Swezey bred both sexes of this wasp from cells found in the decaying wood of *Elaeocarpus* and stored with *Dyscritomyia* flies. Scarce as this insect seems, it has, nevertheless, a wide range on Oahu, for more recently (November 12, 1926) Swezey, while collecting at an altitude of about 2,000 feet on Mt. Kaala, Waianae range, captured a female in her nest in a "Kukui" (*Aleurites moluccana*) log, its presence being indicated by the quantity of sawdust on the ground beneath the burrow. The latter, which contained at least three cells was provisioned mainly with the Mexican lantana gall-fly (*Eutreta xanthochaeta* Ald.), an insect introduced to help destroy the obnoxious Lantana bush, and with the two endemic Diptera, *Discritomyia* sp. and *Caenosia dexioides*.. As usual, these flies were stored headfirst in the cells. There was one egg and one wasp larva in the nest. On January 16, of the following year, Swezey captured another female *abnormis* and

discovered another nest of this species in a dead *Osmanthus* (native olive) branch. It was provisioned mainly as in the first nest, the fly *Eutreta xanthochaeta* predominating over native *Sarcophagidae* and *Lucilia sericata;* two good cocoons occupied the remainder of the nest, one producing a male wasp on February 12.

Melanocrabro discrepans Giffard, is a handsome black species with some yellowish white abdominal markings and infuscate wings that inhabits the mountains of Kauai. In February, 1927, the writer found it nesting in an old stump along the Summit Camp trail, at an altitude of perhaps 1,800 feet. The short tunnels seemed to be their own work and it was evidently a colony of long standing. The cells were stored, as far as could be ascertained, with flies of the family Dolichopodidae.

Flies of the genus *Pipunculus* sometimes fall victims to Hawaiian Crabronids (*Hylocrabro tumidoventris*), as do these and Tipulidae as well, in other countries (see Scott H., Notes on the Nesting-Habits and Prey of Two British Species of Crabronidae, Ent. Mo. Mag. 3rd Series, XI, p. 156-160, 1925).*

Crabro may not be particularly skillful at capturing her prey; she poises briefly before her intended victim and makes a dart-like pounce, frequently missing, but sooner or later seizes a fly. Thus have I seen the common lowland *Xenocrabro distinctus* (Sm.) reddened by the soil in which she nests, capture the housefly, grasping it in her legs. One of these flies was caught in mid-air. Once firmly seized, the wasp sets about stinging it, letting go her hold of any support, and frequently falls on her side in her concern. In this connection may be mentioned the hunting operations of *Crabro,* sp. near *vicinus* Cress., a rather slender wasp that occurs well up in the Sierra Nevada Mountains of California: "At the end of July, 1925, at an altitude of about 7,500 feet, near Lake Tahoe, as the sun was leaving the forest floor, I noticed numerous restless *Anthomyid* flies,

* Perhaps worthy of note in this connection is the fact that *Nesocrabro stygius* (Kirby) in its compact build, nearly transparent wings, and the slightly greenish sheen of the abdomen, bears a superficial likeness to its endemic Sarcophagid prey. Perkins (l. c. lxxxvii) has noted that: "Some of the species of *Nesocrabro* emit a shrill noise, when on the wing, which much resembles the note of the Tachinids they are seeking."

apparently all of one species swarming on a sunny boulder, the latter being pleasantly warm. Here and there among the flies and apparently causing them no concern basked a few of their wasp enemies. After a sufficient warming up these would fly upwards a short distance, would poise in air, draw back as if taking aim, and then make a slanting dart at a fly. Misses were frequent but nevertheless many flies were caught in the curled grasp of *Crabro*, the wasp sometimes stinging her captive on the boulder or else immediately flying off with it. These insects were thus active for at least forty-five minutes after the sun had left the boulders for greater heights, the last wasp disappearing at 6:57 P. M."

In soil-nesting forms the tunnel may give off as many as ten cells; those *Crabro* that nest in decayed wood—the soft *Elaeocarpus* tree being a favorite with such aculeates as *Crabro*, *Odynerus* and *Nesoprosopis*, on Oahu—seem to make fewer cells; each cell is well stuffed with flies whose heads usually point away from the entrances; some of the victims may twitch feebly, while others appear motionless; an egg of comparatively large size—3 millimeters long in the case of *Xenocrabro distinctus*—is laid at the throat of one of the more interior of the flies and the chamber stoppered with soil or with sawdust, as the case may be. The cocoon of *Crabro* (Fig. 8) is of distinctive form; the remains of the prey littering the sides and bottom of the cell. The pupa (Fig. 9, for *H. tumidoventris* (P.) is stout and with lateral, abdominal finger-like processes. But these insects do not always transform into pupae soon after the cocoon is spun; there may be a resting stage (Fig. 10, *Hylocrabro tumidoventris*) over a considerable period, and comparable perhaps to the larval hibernation of most solitary wasps in temperate regions. The larva turns somewhat yellowish, becomes more wrinkled, better segmented, and assumes a curved, quite motionless posture; furthermore, its metabolism becomes much retarded, so that the dorsal vessel pulsates far more slowly than when the larva is active or when it straightens out considerably before pupation (Figs. 11 and 12).

The Hawaiian *Crabro* are noticeable, generally speaking, for their comparative tameness and they frequently alight upon one's hands or clothing.

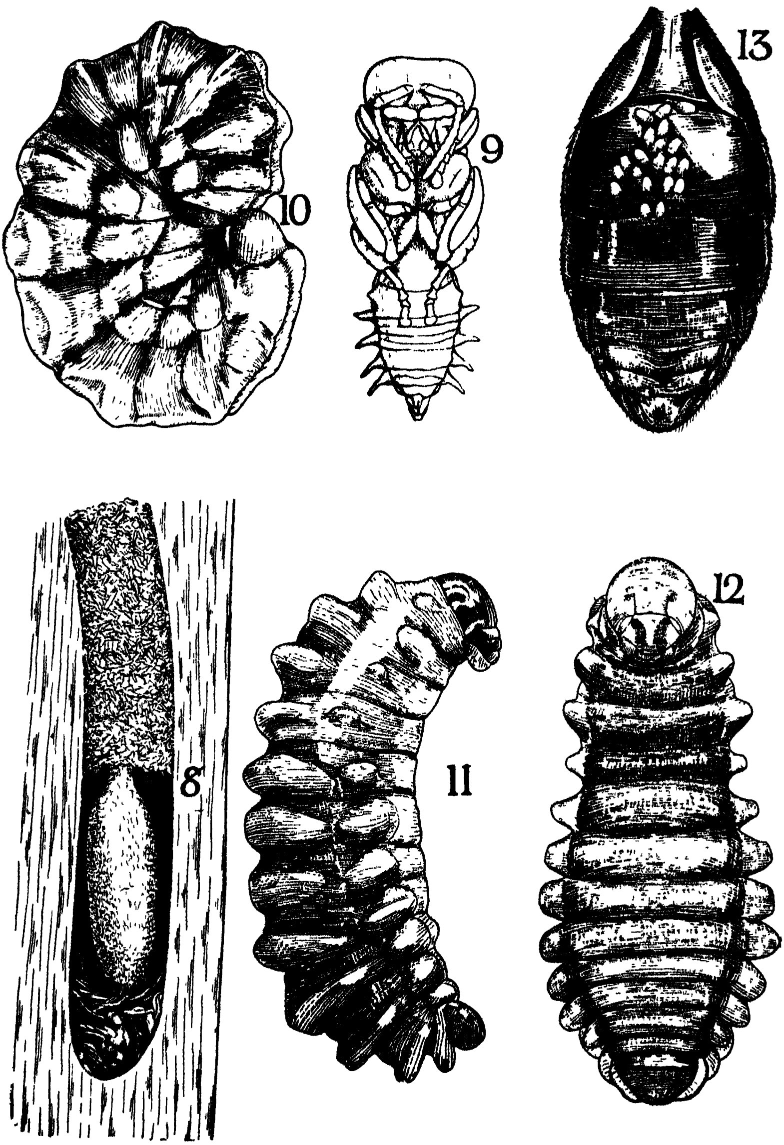

Fig. 8. Cell and cocoon of *Hylocrabro tumidoventris*, var. *leucognathus* (P.), in trunk of fallen *Acacia koa*. Kilauea, Hawaii. November, 1919.

Fig. 9. Pupa of *Hylocrabro tumidoventris*. Mt. Konahuanui, Oahu. October, 1919.

Fig. 10. *Hylocrabro tumidoventris;* resting larva.

Fig. 11. *Hylocrabro tumidoventris*, var. *leucognathus*, unrolled after resting period. Kilauea, Hawaii. April, 1920. Lateral view.

Fig. 12. *Hylocrabro tumidoventris*, var. *leucognathus*, unrolled after resting period. Kilauea, Hawaii. April, 1920. Ventral view.

Fig. 13. *Xenocrabro unicolor*, showing colony of mites on second ventral abdominal segment. Mt. Kaala, Oahu. December, 1919.

Mites (Acari) are often found upon these and other wasps, and figure 13 portrays a few upon the venter of *Xenocrabro unicolor.*

Crabronidae in other parts of the world may have a considerable diversity of prey among their genera,—some capture Hemipterous bugs, one species preys on ants, other small ones prey on book-lice (Psocidae), and on Aphids. Kohl (Die Crabronen der palaearktischen Region, 1915, Vienna) devotes a considerable part of his monograph to the habits of these wasps. See also Hamm, on the Biology of the British Crabronidae. (Trans. Ent. Soc. London, 297-331, 1926.)

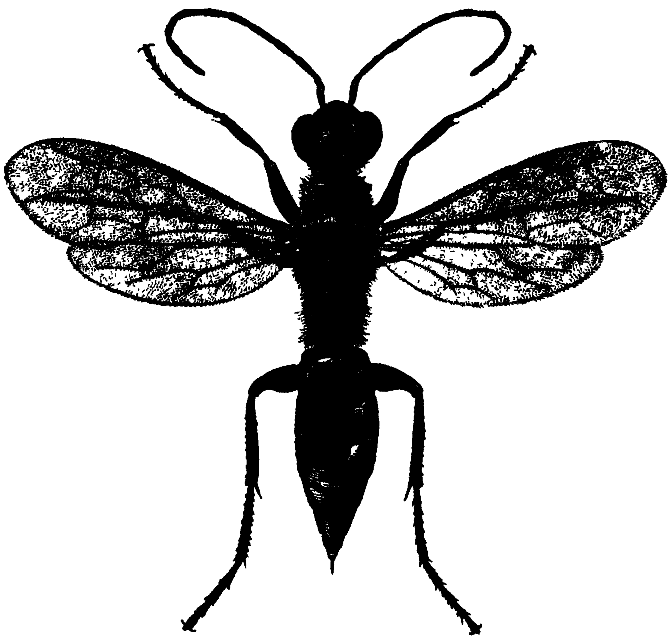

Fig. 14. Philippine-Hawaiian Cockroach Wasp, *Dolichurus stantoni.*

AMPULICIDAE

Dolichurus stantoni (Ashmead)

This polished black little cockroach wasp (Fig. 14) was introduced from the Philippines in 1917. It soon spread to the mountain summits of Oahu where, with the immigrant American spider wasp *Anoplius luctuosus* (Cresson), helps augment

the scant Aculeate fauna of our islands. It also occurs in drier regions and has spread of itself to the islands of Hawaii, Maui, and Kauai. According to one observer it has greatly reduced the number of small roaches in the uplands of Oahu, where such species as *Cutilia soror* (Brunn.) and *Allacta similis* (Sauss.) serve as its prey. These roaches are stung to a state of feeble resistance and shorn of part of their antennae, dragged to a newly-found crack or porosity in a lava rock, etc., an egg laid along one of the middle coxae, and the "nest" plugged with grains of lava and other debris. But one roach is supplied to each grub. The pupa is enclosed in a stout cocoon; the former as seen from the figure (Fig. 15) is of somewhat Mephistophelian aspect. A more detailed account of the biology of this

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Fig. 15. *Dolichurus stantoni*; male pupa.

insect is given in Bull. 14, Ent. Ser., (Philippine Wasp Studies, 1919,) of Exp. Station, H. S. P. A.

PSAMMOCHARIDAE

Anoplius luctuosus (Cr.), a blue-black spider wasp of Western United States, was first taken in the Hawaiian Islands in 1910 (Swezey, Proc. Haw. Ent. Soc., II, 187; 1912.) It proved very adaptable to insular conditions, spreading rapidly to the other islands and is now found from sea-level to far up the mountains; in fact, it is one of the wind-borne insects usually

met with at the summit of Mauna Loa, Hawaii, elevation 13,625 feet.

It almost invariably seems to nest in the ground; Bridwell, however, (Proc. Haw. Ent. Soc. III, *275*, 1917), observed one nesting in rotten wood in the mountains. The female digs short burrows, sometimes several close together, and provisions each with a paralyzed spider, not confining her attention to one species of Arachnid, however,—she often captures the jumping spiders (*Attidae*)—and upon whose abdomen she lays an egg. The full-fed larva weaves a tough brown cocoon. Though very numerous here, *Anoplius* does not seem to have noticeably affected the spider fauna of the Hawaiian Islands.

Scoliidae

Scolia manilae Ashmead

This black and yellow wasp is native to the Philippine islands, where it has a wide distribution in the more open lowlands. It measures from about 8 to 12 millimeters and is one of the smallest species of the genus. Introduced into the Hawaiian Islands as an enemy of the *Anomala orientalis* beetle by Mr. F. Muir in 1916, it has done the work so well that this white grub, once very destructive in certain cane fields on Oahu, is now reduced almost to a nonentity. *Scolia* also preys upon the grub of the Chinese Rose-Beetle (*Adoretus sinicus* Burm.), but as the wasp dislikes to operate in grassy areas such as lawns, where the *Adoretus* very commonly breeds, it is thus not nearly so efficient an enemy of this beetle. The wasp, while a very successful parasite, is not, at least in the female sex, so powerful a flier as some other exotic Aculeates, as *Notogonidea*, *Dolichurus* and *Anoplius;* for that reason it was deemed necessary to transport it to other of the Hawaiian Islands. There it soon became established but is noticeably more abundant on the drier than on the more humid plantations.

Several other Scolioid wasps of the genus *Tiphia* have been brought to the Hawaiian Islands, but for reasons unknown never became established here. Perhaps it is because the Tiphias do not, as *Scolia* does, paralyze their prey to permanent tranquility, and thus the chance for the parasitized grub of rub-

bing off the wasp's eggs are present, and, too, the fact that they usually breed much more slowly than *Scolia* may be part of the explanation.

A fuller account of *Scolia manilae* is given in Bull. No. 14, Ent. Ser., Haw. Sugar Planters' Experiment Station, 1919. See also Swezey, Hawaiian Planters' Record, XVII, 50-55, 5 figs. 1917, and Muir, Ann. Ent. Soc. Amer. XII, 171, 1919.

EUMENIDAE

The fact that there is so large a number of Odyneri peculiar to the Hawaiian Islands, that most of these wasps—in common with other endemic Aculeates—are distinctive for the four principal islands, and that many live in a special environment, indicates that nature has found their forebears a very plastic lot. Certain ones, as *Odynerus nigripennis* (Holm.) and *Nesodynerus rudolphi* (D. T.), are so constituted that they flourish in the dry lowlands as well as in the humid mountains; the majority, however, are fairly well restricted to certain biological zones, and this condition as well as the differences in size between many species certainly go a long way towards insuring a proper distribution among them of their caterpillar prey. A few of the lowland forms nest in the ground, the others with very rare exceptions utilize ready-made cavities, such as holes and cracks in lava rock and old beetle borings in wood, or to some extent themselves bore into this decaying material; the one true architect that has been identified builds free cells of mud.

The more widely distributed kinds may prey upon a variety of moth caterpillars of the Microlepidoptera type, while those limited to particular districts are more likely to select fewer species. In very dry regions it is mainly following the scant seasonal rainfall (not invariably annual) that these wasps, and their caterpillar prey that feed upon the refreshed vegetation appear. The egg of the Odyneri is suspended by a filament from the wall of the cell, the larva is comparatively obese and when fully fed spins a sort of silvery sheet more or less appressed to the cell walls; the pupa is much like a cramped or mummified adult.

Dr. R. C. L. Perkins, particularly in his "Introductory Essay on the Fauna" (Fauna Hawaiiensis I, 1913) has treated the Hawaiian Odyneri at length, and it is my purpose here merely to give a few of my observations—to which those of others may be added—on several of these species of wasps.

Odynerus oahuensis D. T.

This is a fat, rather dull black wasp with some red markings, a rather uncommon insect that inhabits the mountains of Oahu. It is distinguished for its architectural ability, standing alone in this respect among the Hawaiian Odyneri whose nesting habits are known. Nor does this habit appear common among *Odynerus* in other parts of the world.

It is usually extremely difficult to follow the line of flight of our Hawaiian wasps to their nests, for with their swiftness and generally black color they are soon lost to our eyesight, while the often rugged and wooded nature of the country which many of these wasps inhabit permits of no rapid nor long-impeded movements on the part of the observer. Rather are their cells discovered by accident or while one is searching for various wood-inhabiting insects. While collecting on a steep ridge at the head of Manoa Valley, Honolulu, in February 1920, a female *Odynerus oahuensis* was seen resting on the crown of a Pandanaceous vine (*Freycinetia arnotti* Gaud.) and holding beneath her in her mandibles, a bright, pale greenish moth caterpillar. She was soon lost to view in a low flight down the slope among ferns and vines, but I took up my position at the point where I saw her disappear, eating my lunch there in expectation of seeing her pass by; this was realized, however, only more than an hour later when she flew quickly out of a mere shell of a rind-fragment of a *Freycinetia* stem (ie-ie vine) that happened to be suspended in the shade on a piece of dead and curled frond of a fern. This shell contained two cells of *oahuensis* (Fig. 16) besides an old egg-cocoon of a spider; one cell was sealed, the other was still being stored. I detached the piece of *Freycinetia* and soon thereafter noticed the architect searching vainly for her cells; on my approaching the latter to near their former site she alighted on my hand with a small green cater-

pillar and then plunged for one-half her length into the cell, remained thus for less than a minute and took wing, returning 25 minutes later with very small green caterpillar about 4.25 millimeters long. The cell which she was provisioning thus rather slowly was half filled with small caterpillars upon which a young wasp grub was feeding. Thus it seemed to be a case of "progressive provisioning" necessitated when food is scarce (see Bequaert, Vespidae of the Belgian Congo, Bull. Am. Mus. Nat. Hist. N. Y., August, 1918, p. 220, re *Synagris*). The *oahuensis* larva fed to repletion after I gave it a mutilated Phycitid larva (*Cryptoblabes aliena* Swezey) 7 millimeters long; it successfully spun a cocoon, and in about two and a half weeks thereafter this cell and its mate produced male wasps. The pupa becomes quite active in its late development so that it may then move its legs and open and shut its jaws.

The wasp also nests in curled-up leaves, but its small group of cells are occasionally found suspended from some earthen bank alongside a trail, by a fine rootlet (Fig. 17) and where they are with some difficulty distinguished from the little lumps of soil naturally adhering to roots in similar situations.

Evidently *Odynerus oahuensis* does not always prey upon the same species of caterpillar but conforms to the material the locality affords. Thus, I have seen her extracting from unopened flower heads of *Acacia koa* Gray that had fallen to the ground presumably because of the damage they had received, the fat, dirty whitish caterpillar of the Tortricid moth, *Adenoneura rufipennis* Walshm., and identified by Mr. O. H. Swezey as an insect hitherto only known to attack the green seed-pods of this leguminous tree. These little caterpillars were only 3 or 4 millimeters in length and so a considerable quantity would be required to store a cell. In hunting for these larvae the wasp flies low over the ground alighting every now and then, examining the flower heads, rejecting many but on finding one containing a larva she lets go all else in curling herself around the sphere, bites into it and finally pulls out her prize. Cloudy weather, so very frequent in the Hawaiian mountains, seemed not to interfere with her operations. One or two species of *Coelopencyrtus* parasites have been bred from the cells of this wasp (Perkins, Fauna Hawaiiensis, I, p. xcvii,

1913). In August, 1909, Swezey reared *Eupelmus paraxestops* Perkins, from the larva of *O. oahuensis* taken on Tantalus, Oahu.

Odynerus eucharis Perkins

This insect much resembles the former in appearance and habitat and occurs rather sparsely in the mountains behind Honolulu. It is uncommon, probably in the sense that most of the rare Odyneri are, in that they occur generally as colonies, within certain altitudes, and are more or less periodical in appearance, whether it be a matter of seasons or of interference by parasites. At an altitude of about 1,700 feet, a couple of wasps were observed flying about a broken bough of a koa tree and entering it by means of some old boring. Examination showed the wood to be much tunneled by the large mountain termite, *Neotermes connexus* Snyder, and in whose outer, deserted flattish tunnels were three or four old nests of *Odynerus eucharis*, several cells to each, that were partitioned off with earth and contained remains of cocoons and some dried caterpillars of fairly large size, besides a dead wasp. This is all that was learned of the nesting habits of the species.

Odynerus pseudochromus Perkins

This red and black wasp is perhaps the commonest of the higher upland species that inhabits Oahu. It seems generally to nest in hollow twigs, also in various beetle borings, as those of Anobiids (Bridwell, Proc. Haw. Ent. Soc., IV, 393, 1920) which it partitions with mud or disintegrated lava into several cells; these are stored with various micro-lepidopterous caterpillars, Bridwell (Proc. Haw. Ent. Soc., IV, 123, 1919) having found one nest provisioned with the larva of the Ohia Tortricid *Eccoptocera foetorivorans* (Butler). Figure 18 represents a portion of a fragile, hollowed-out root suspended from a bank that has been utilized by the wasp as a single-cell nest, plugging the upper extremity and lateral hole with disintegrated lava rock mixed with saliva. Figure 19, A to E, shows, illustrated to the same scale, the larval mandibles of the wasp grub in its five stages; it will be noticed that as in general with other wasp grubs of this nature, the jaws in the last instar are of necessity

much the stoutest and most fitted for chewing their prey. The slightly spinose pupa is illustrated in figure 20.

Odynerus pseudochromoides Perkins

Very like the last species but less abundant is *Odynerus pseudochromoides.* It is occasionally seen in company with other species on forest trails where flying to a particular spot it selects disintegrated lava rock for plugging up its nest, which in the only case observed was a pair of old cells of *Odynerus oahuensis.* The cells had been capped with mud (Fig. 17) and in due time yielded a pair of *O. pseudochromoides.*

Odynerus paludicola Perkins

A rather small and rare, shining black wasp with a few red markings that inhabits the mountains of Oahu. It will be noted, by watching its actions, that we are considering a nervous and fidgety insect: in fact, it runs along dead twigs as if distracted, and at once stands out in contrast—when gathering nesting material—to the more deliberately moving *Nesodynerus rudolphi*

EXPLANATION OF PLATE XVI.

Fig. 16. Cells of *Odynerus oahuensis* in rind fragment of *Freycinetia* vine, adhering to dead fern frond. Manoa, Honolulu, 1,300 feet. February, 1920. Slightly enlarged.

Fig. 17. Cells of *Odynerus oahuensis*, that were appropriated by *Odynerus pseudochromoides* and from which a pair of the latter issued. The cells are suspended from a rootlet. Manoa Cliff Trail, Oahu. August, 1920. Slightly enlarged.

Fig. 18. Portion of a dead and hollowed rootlet occupied by the nest of *Odynerus pseudochromus.* Manoa Cliff Trail, Oahu. December, 1919.

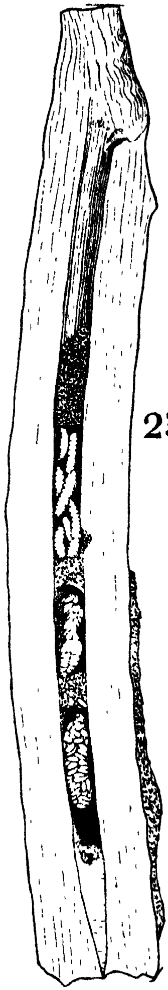
Fig. 19. Larval jaws of *Odynerus pseudochromus.* Five successive stages to last stage of the same specimen. C-D in moult. All to the same scale. Mt. Kaala, Oahu. December, 1919.

Fig. 20. Pupa of *Odynerus pseudochromus.* Castle Trail, Oahu. 2,000 ft. December, 1919.

Fig. 21. Nest of *Odynerus paludicola* in boring of Anobiid beetle in dead *Acacia koa* limb. Semi-diagrammatic. Manoa Cliff Trail. August, 1920.

Fig. 22. Pupa of an Eupelmid wasp parasitic on the larva of *Odynerus paludicola.* Manoa Cliff Trail, Oahu. August, 1920.

Fig. 23. Nest of *Odynerus orbus* in beetle boring in *Myoporum* twig. Dry forest, Kilauea, Hawaii, 4,000 feet. November, 1919.



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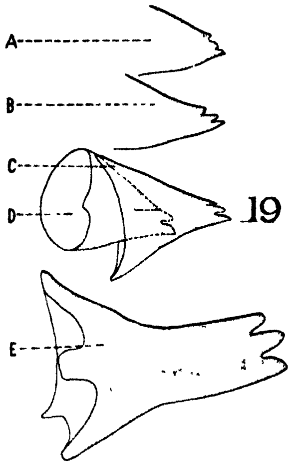

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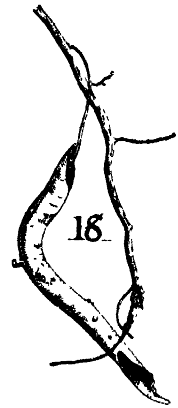

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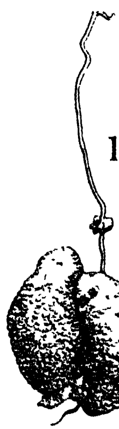

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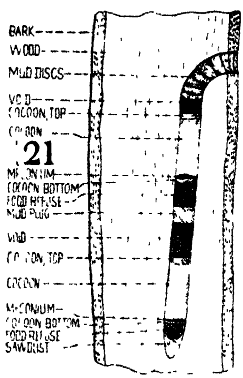

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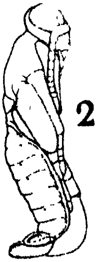

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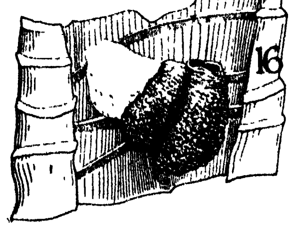

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that is so common on the forest trails. In the case observed, *paludicola* nests in the deserted borings of *Holcobius glabricollis* Sharp, an Anobid beetle whose cylindrical tunnels seem exactly to fit the wasp. The cells are stored with the larva of *Hyposmocoma alliterata* Walshm. (Hyponomeutidae), a tiny case-bearer abundant on the bark of the koa. A similarly provisioned nest was found by Swezey in old Cerambycid beetle borings in Ohia lehua (*Metrosideros polymorpha*), at Pupukea. This *Hyposmocoma* case is disc-like and flattish and before the occupant pupates, is secured to the tree trunk whence it is pried free by the hunting wasp, bitten open and the morsel extracted, stung to imperfect paralysis and carried to the nest. Three nests were examined, of which two had a couple of cells while the third but a single one. Fig. 21 is a semi-diagrammatic illustration of a two-cell nest in longitudinal section; worthy of notice is the number of mud, or perhaps disintegrated lava discs that plug up the entrance, as also the voids or empty chambers before the cells. The egg of *paludicola* is about 2 millimeters in length, almost equalling in size some of the stored caterpillars, of which 27 were found in one cell; the wasp larva spins a cocoon appressed to the cell walls and above the food-refuse as figured, but it voids its intestine for the last time, in the base of the cocoon as a solid meconium. This wasp, in common with many other Hawaiian aculeates, suffers in the larval state from the attacks of small wasp parasites; in this case, from *Eupelmus chloropus* Perkins, which in the instance noted was reared to the number of about a half dozen, from the inner of two cells. Figure 22 illustrates the pupa of this little parasite.

Odynerus threnodes Perkins

Odynerus threnodes and *O. dubiosus* are very closely related and occupy much the same lowland region on Oahu. Both are small black wasps of the same nervous temperament as *O. paludicola*. One or both of these species occur in the city of Honolulu, and on the low and dry Ewa Coral Plain, where they may be observed searching dead twigs in a hurried manner, running along one this way and that, and eventually locating and dissecting a fat little caterpillar out of a small bundle of silk-

spun debris, stinging and bearing it away.* In one spot, small holes an inch or two in diameter above but widening as they penetrated the large piece of flat coral stone retained a bit of moist soil, and to which regularly these little wasps in company with other Odyneri paid visits for cell materials.

Odynerus unicus Perkins

This all-black wasp occurs in the mountains of Oahu, and at Pupukea, in the Koolau Mountains, was found utilizing the old borings of native longicorn beetles in a *Bobea* tree.

Nesodynerus rudolphi (D. T.)

This wasp is not infrequently seen in Honolulu itself but it is more at home from low to moderate elevations in the mountains, where chiefly because of its deep iridescent blue wings it often attracts attention when gathering soil on the moister parts of the trails. It nests in holes in rotten trees, also in porosities in rocks and utilizes as well, the old mud-cells of *Sceliphron*, the spider wasp. Bridwell (Proc. Haw. Ent. Soc., IV, 1919, 122-123) records this species nesting in old *Sceliphron* cells and storing these with *Amorbia emigratella* Busck (Tortricidae) caterpillars. I have also seen this wasp—as in *O. oahuensis*—examining the fallen and unopened flower-head of *Acacia koa* for caterpillars. Perkins (Fauna Hawaiiensis) also gives the prey of *rudolphi* as *Crocidosema plebeiana*, *Eccoptocera foetorivorans*, *Heterocrossa* and *Thyrocopa*. It is parasitized in the grub stage by a Chalcidoid (?) wasp, a grub of which was once found feeding externally upon its larva.

Odynerus orbus Perkins

An entirely black species of moderate size that inhabits the region about Kilauea Volcano, 4,000 feet elevation, Hawaii. In the "dry forest" (Kipuka Puaulu) at Kilauea, *orbus* was found nesting in deserted cylindrical beetle borings in Naio or Bastard Sandalwood (*Myoporum sandwicense* Gray). Figure 23 shows the larger of two nests. Commencing first with a plug (of

* *Odynerus dubiosus* Smith as well as some other species have been observed by Swezey hunting for the sugar-cane bud-worm (*Ereunctis flavistriata* Walshm. and other Tineid caterpillars (Bull. No. 6, Div. Ent. H. S. P. A. Experiment Station, 31-32, 1909).

decayed wood or frass of the beetle larva), there follows a large void space, then a thick plug, then the cell stored with whitish or pinkish little Tortricid moth larvae, following this is a second cell containing an *orbus* pupa, while the third compartment has a large *orbus* larva filled to distension with the pupa of *Coelopencyrtus orbi* Timberlake (Proc. Haw. Ent. Soc., IV, pp. 422-4, 1920.) a little wasp, two adults of which were also found in a stored and sealed cell of another *orbus* nest in *Myoporum*.

Odynerus nigripennis (Holmgren)

This large, wholly black species is found on the islands of Oahu, Hawaii and Maui, and occurs from sea level to at least 4,000 feet in the mountains. Prior to the recent advent of *Pachodynerus simplicicornis* (Sauss.) to these islands it was the most abundant Odynerid about cities and towns, nesting in stone walls, old mud-dauber (*Sceliphron*) nests, etc. It seems to be losing ground before this very adaptable competitor, for it was comparatively scarce in 1926, in Honolulu, if not elsewhere as well. It suffers much also from the attack of Chalcid wasps. Swezey (The Sugar Cane Leafroller, etc., and Natural Enemies, Bull. 5, Div. of Ent. Experiment Station, H. S. P. A., 50-53, 1907), who gives an account of the life-history of this beneficial insect, has found it preying upon the caterpillars of various species of *Omiodes*, including the sugar cane leafroller (*Omiodes accepta* (Butl.), on *Hymenia recurvalis* (Fab.), *Amorbia emigratella* Busck and *Mecyna aurora* (Butl.). The wasp larva may remain in the quiescent stage in its cocoon for six months or more (Swezey, l. c.). In the mountains it catches the caterpillars of some of the native Geometrid moths, as *Scotorythra caryopis* Meyr. Occasionally the prey of *nigripennis* has been parasitized internally by a Tachinid fly (*Frontina archippivora*) which may successfully complete its transformations in the wasp's cell. Five species of Chalcidoidea wasps have been found to parasitize the larva of this Odynerid; they are as follows: *Melittobia hawaiiensis* and *peles* * Perkins, and *Coelopencyrtus mauiensis* Timberlake, *C. odyneri* Timberlake and *C. swezeyi* Timberlake.

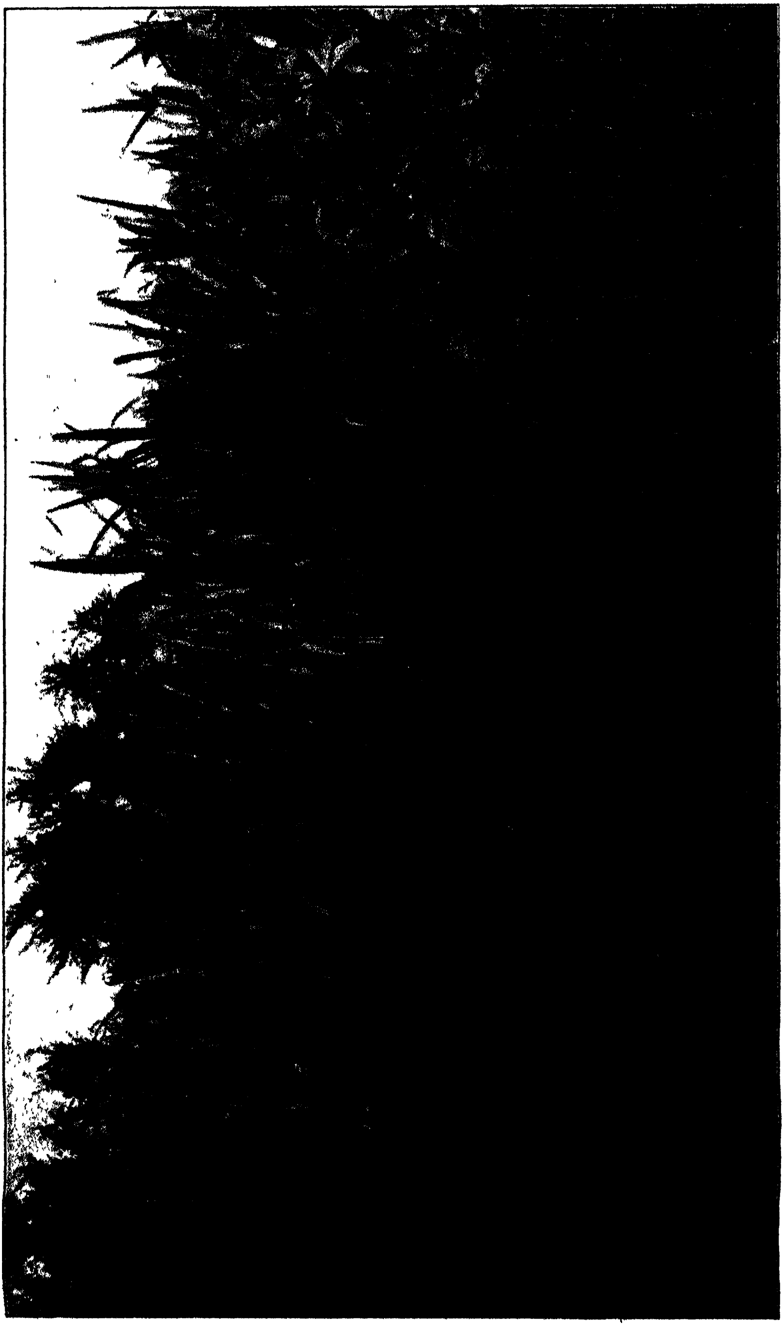
* *M. Peles* was also reared from the nest of another species of native *Odynerus* found by Swezey on Mt. Kaala, Oahu, November, 1926.

The white-banded *Odynerus radula* (Fabr.), the representative of *O. nigripennis* on Kauai, often nests in old mud-dauber cells on stone walls, etc. In breaking open such cells I have found a great deal of mortality among these wasps and *Pison hospes*, a spider catcher, that were unable to make their way through the mud walls.

At Eleele, on the island of Kauai in February, 1927, I have seen the little red-marked *Odynerus blackburni* Kirby, fairly swarming about a fence built of lava rock (Plate XVII) in whose porosities they nested and often retired in dull weather and presumably also for the night—head facing outwardly. Comparatively few females were seen provisioning their nests; the tiny caterpillars used for this purpose are probably *Cryptoblabes aliena* Swezey (Phycitidae) of trash-feeding habit. The cells are stoppered with the moistened red soil of the locality. This wasp also utilizes the deserted cells of the *Sceliphron* mud-dauber. *Odynerus kauaiensis* Perkins, another lowland wasp with a white-banded abdomen, was also found resting in lava rock porosities and no doubt frequently nests therein.

Pachodynerus simplicicornis (Sauss.)

This thick-set, yellow-winged and yellow-banded black wasp that is now so predominant in the lowlands, is a recent immigrant from the warmer parts of the American mainland, to which this subgenus is peculiar. Mr. W. M. Giffard first discovered it in the Hawaiian Islands, in Honolulu during the fall of 1911 (Giffard, Proc. Haw. Ent. Soc., II, 199-202). It was found partitioning the mud cells of *Sceliphron caementarium* and provisioning them with caterpillars of *Cryptoblabes aliena* Sw. It may exist almost in swarms about buildings and is a very common wasp around plantations, and also in such localities as the Ewa Coral Plain, where the porous coral affords it excellent nesting places. It is frequently seen on the blossoms of *Crotalaria* and has the habit common among *Odyneri* in parts of the United States but not observed in the Archipelago among native species, of congregating in some numbers on plants to pass the night. Mr. O. H. Swezey made some observations on this insect at Hana, Maui, October 16, 1926. He found them flying in hundreds about the eaves and walls of the plantation



Wall of porous lava rock along edge of field of sugar cane. Eleele, Kauai. Nesting site of *Odynerus blackburni*.

store in search of holes for nesting. Upon examining some of the cells he found them stored with the larvae of *Crocidosema lantana* Busck, a tortricid moth imported from Mexico to destroy the undesirable lantana plant that covers so much of our lands. *Pachodynerus* from this standpoint is an undesirable insect. But it also stores the larva of the injurious Tortricid, *Amorbia emigratella*. In its mainland home it has some effective enemies, important among which is a Rhipiphorid beetle that parasitizes its cells.

POLISTES

Polistes aurifer Sauss., *Polistes hebraeus* Fab., and *Polistes macaensis* Fab. are the common "yellow jackets" throughout the islands, and build the familiar, social paper nests under eaves, palm leaves, in open buildings, etc.

Polistes aurifer is probably an immigrant from California, the other two being of Asiatic origin. All are caterpillar-hunters and therefore useful insects, though effective stingers. They hunt armyworms and leafrollers, etc., in the lowlands and cane fields, and in the mountains, among other larvae, those of *Scotorythra* on *Acacia koa*, etc., trees. These they skin and chew into a pulp with which to feed themselves and their young. The caterpillar of the Pyralid moth *Pyralis mauritialis* Boisd. feeds in old *Polistes* nests (Swezey, Proc. Haw. Ent. Soc., II, No. 3, p. 138, 1910).

Polistes aurifer in Hawaii is very commonly parasitized (stylopsized) by insects of the Order Strepsiptera, that may be found partly protruding from between the abdominal segments of the host.

A good popular account of *Polistes hebraeus* is given by R. Veitch (see The Hornet in Fiji, Agric. Rep. No. 2, Colonial Sugar Refining Company, Ltd., Sydney, April, 1917).

Vespa occidentalis Cresson

This yellow and black "hornet" has been found on the northwestern highlands of the island of Kauai, being first taken at Kokee, by A. Kusche in January, 1919. A year later Messrs. Rock and Agee when in the Alakai Swamp, at an elevation of between 3,500 and 4,000 feet, took a single queen benumbed with cold and clinging to the underside of a fallen post, where she was evi-

dently hibernating. Subsequently it has been taken in this same humid region, as follows: Kaholuamano, April, 1920 (A. Kusche); Olokele Canyon, Milolii, and Nualolo, August, 1925 (O. H. Swezey). Thus, it has spread over many square miles, Swezey having found it especially common on the Nualolo ridge, where it was flying very actively about Ohia trees. He also noted a nest of this wasp in the ground. In February, 1927, it was found along the Summit Camp trail some miles back of the town of Lihue. This fierce insect will probably be of no benefit to the endemic fauna.

The natural habitat for *Vespa occidentalis* is Western United States, and the common prey for many species are flies.

BETHYLIDAE

These include small to very small blackish or brownish wasps that are parasitic upon the larvae of beetles and of moths. The genus *Sierola* is enormously developed in the Hawaiian Archipelago, Fullaway (Bishop Museum, Occasional Papers, VII, p. 57-159, 1 pl., 1920), having described 171 species and subspecies therefrom, and in many cases has recorded their caterpillar host. Many of the forest forms may be obtained by sweeping bushes and trees. *Sclerodermus* is a much smaller genus, with the females generally apterous.* Their hosts are usually the larvae of boring moths, and so these wasps are to be found in dead wood, under bark and in twigs where these caterpillars occur. Bridwell (Proc. Haw. Ent. Soc., IV, p. 21-38, 1919, and 291-314, 1920) has given us some very excellent accounts of the biology of *Sclerodermus* and other Bethylidae and has experimented with them with interesting results.

Swezey, in "A Preliminary List of the Hymenopterous Parasites of Lepidoptera in Hawaii" (Proc. Haw. Ent. Soc., III, p. 101, 1915) lists several Bethylidae and their moth caterpillar hosts.

Epyris extraneus Bridwell is an immigrant from the Orient; it is a comparatively large species that preys on the larva of the common trash-dwelling tenebrionid beetle, *Gonocephalum seriatum* (Boisd.) (see Williams, Proc. Haw. Ent. Soc., IV, 55-63, 2 pl., 1919).

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* Timberlake (Bull. 31, Bishop Mus., p. 19-21, 1926) gives a key to the majority of Hawaiian species of *Sclerodermus*.

Notes on Hawaiian Coleoptera (Curculionidae, Proterhinidae and Cerambycidae) and Descriptions of New Species.

BY DR. R. C. L. PERKINS.

(Presented by O. H. Swezey at the meeting of Dec. 2, 1926.)

In this paper I have described three new species of weevils of the genus *Rhyncogonus*, one species of Proterhinus and thirteen new forms in the endemic Longicorns. The *Rhyncogonus* are all in the collection of Mr. W. M. Giffard, the others in various collections in Honolulu. I am very much indebted to the captors or possessors of these very interesting and important additions to the Hawaiian fauna for the opportunity of studying and describing them. The majority of the species are at present to be considered as great rarities, being known only from single specimens.

In the description of new species of Cerambycidae, the first paragraph in each is intended as a rather long diagnosis of the species, sufficient by itself for a quick identification of the species, and to separate it from any other at present known.

CURCULIONIDAE

In Proceedings Hawaiian Entomological Society, IV, No. 1, pp. 77-82, 1919, the late Dr. Sharp published a short but important paper on the genus *Rhyncogonus*, dealing mainly with the characters of the male genitalia and proposing that the genus should form a new tribe, *Rhyncogonini* (*'Rhyncogonides'*) of *Otiorhynchidae*, on account of the peculiarity of the buccal organs. In addition to one species described as new, three or four others were indicated as likely to prove so, all these specimens being included in Mr. W. M. Giffard's collection. These undescribed specimens have recently been entrusted to me for examination and are dealt with below. I have also made some additional remarks on species previously described by myself, this being rendered necessary, as characters which previously seemed unimportant prove to be useful for distinguishing species.

As nearly all the species of which large series have been taken seem to be variable even in characters considered important, effective descriptions are not easily made. In long and full descriptions so many details will have to be qualified by "sometimes," "usually," "rarely," etc., as to render these a source of hindrance rather than help, while, until the species have been more fully collected, it is difficult to know what specific characters can really be trusted. I anticipate that many new species remain undiscovered at present, perhaps twice or even several times as many as have yet been described.

As Sharp has pointed out, the median lobe—which part he compares in several species—affords very slight characters for specific separation, even supposing these to be absolutely constant, and it must be remembered that in most cases the species he dissected were not closely allied forms but species widely separated by external structural characters. After an examination of the aedeagus of all the species which he examined and of a number of other forms, I am satisfied that the characters of the median lobe are of little value compared with external characters, but I think that more useful ones may possibly be found in other parts of the genitalia. The Hawaiian insects in the large genera of different Orders, examined by me, appear generally to either have extremely valuable genital characters, e. g., the bees of the genus, *Nesoprosopis*, the Delphacid leafhoppers, the Agrionine dragon-flies, etc., or to have these of so uniform an appearance, e. g., the wasps of the genus *Odynerus, Rhyncogonus, Plagithmysus,* and some other Coleoptera, as to be of little practical use. Where the characters of the genitalia are of little help and the species are also very variable and difficult as regards external structures, the climax of difficulty in the determination of species is reached. Possibly when all the existing species have been collected, *Rhyncogonus* will be found to be one of this class.

Rhyncogonus segnis sp. n.

A large species, about the size of *blackburni* and *stygius*, less black than these, being rather of a dark brown or piceous color. Head in front strigose-punctate, the rostral portion much smoother and sparsely punctured; funicle of the antennae unusually long and slender, its third joint usually not less than three times as long as its greatest width, the first and third club joints subequal. Eyes not very strongly prominent, appar-

ently a little variable. Pronotum coarsely, densely, subrugosely punctured, the surface between the punctures shining, very thinly clothed with short, fine, flavescent setae, which at the sides become somewhat denser and densest at the hind angles, if not abraded. Elytra thinly and almost evenly clothed with short flavescent setae both above and on the deflexed sides, the apex not so strongly attenuate as is usual in *blackburni.* In the female the small intermediate ventral segments of the abdomen are more shining and, as well as the apical one, less densely clothed than in that species. The male, having been dissected, has the ventral segments much abraded and it is impossible to say whether the clothing differed from that of *blackburni.* Of the two female examples one is less wide than the other and has a depression at the base of the abdomen such as is usually found in the male sex.

This is the "*R.* sp. nov. (?) near *stygius*" of Sharp's paper (p. 80). It appears to me quite distinct from *stygius* and *blackburni* by the less prominent eyes and narrower rostrum—both characters noted by Sharp—and especially by the slender funicle of the antennae, the third joint being much longer and the fourth of about the same length as the third joint of the other two species. In some respects it perhaps more resembles *stygius,* but that species has the clothing of the pseudepipleura of the elytra more specialized, with one or more patches or spots formed by thicker or more scale-like appressed setae, while a well-marked band of similar clothing is conspicuous on the hind femora outwardly before the narrowed apex.

Hab. Oahu: Wahiawa, "from *Freycinctia,* Kuhns coll. Tunnel 33." Neither Koebele nor myself when collecting in that neighborhood met with this species, which was probably discovered by Kuhns when searching for land-shells. One male and two females were found. 24—VII—08, a different time of year from that when we visited the locality. Types in collection of W. M. Giffard.

Rhyncogonus obsoletus sp. n.

This name may be used for a form allied to *R. koebelei* and represented by the two male examples dissected by Dr. Sharp. The median lobe of the aedeagus seems to me practically similar to that of *koebelei,* but the great difference in sculpture in species of a genus rather uniform as a rule in this respect probably indicates a very long separation from that species or from the parent stock from which both may have been directly derived. Apart from the dull pronotum with the punctures almost obliterated, the underparts of the body are very different from those of *koebelei.* The basal abdominal segments except for microscopic surface sculpture are nearly smooth with remote and almost obliterated punctures,

the small intermedaite segments much resemble the basal ones in this respect, while the apical segment appears to be considerably less hairy than in the allied species.

The specimens were labelled R. 6 and R. 20 by Dr. Sharp.

Hab. Oahu: Waimano in the mountains, 1908, without special date, but I presume collected on the same trip that produced *segnis* and *freycinetiae* at other rather more distant points in the Koolau range. Types in collection of W. M. Giffard.

Rhyncogonus mutatus sp. n.

The two male specimens referred to *R. sordidus* with doubt by Dr. Sharp, which with their dissections are numbered R. 17 and R. 29, are I think, distinct from that species though closely allied to it and in most respects similar. The rostrum has very sparse and shallow punctures; the pronotum owing to the microscopic sculpture between the punctures is dull, clothed with sparse, short hairs, which at the sides become considerably denser and more conspicuous, but do not form very definite bands. In fresh specimens, at any rate in the female, the reddish yellow hairs of the elytra are conspicuous as in its allies, *sordidus, lanaiensis, lahainae*, etc., and tend to form longitudinal stripes. Though the hind femora have the clothing of the outer surface before the narrowed apex evidently denser than elsewhere, yet the band is poorly developed compared with the much denser and more conspicuous anteapical band of *sordidus*. The chief distinction from the latter, so far as I can judge from the dissected males, is to be found in the ventral abdominal segments, the last of which appears to be only moderately hairy, the two preceding hardly at all. These two and the second have the surface almost smooth, bearing only sparse, remote and feebly impressed punctures. In the female the apical segment is quite sparsely hairy, and the others bear only a few inconspicuous hairs.

Hab. Oahu: Moanalua, 2,000 feet, December, 1905 (Giffard). Two males and one female. Under *sordidus* I have a note that this species was formerly very abundant on Molokai and that apparently the same species was found by Mr. Giffard on Oahu. I have no doubt that I had at some time seen these specimens of *mutatus*, but without the opportunity to compare them with the allied species. Types in collection of W. M. Giffard.

Rhyncogonus sordidus Perkins

I noted the occurrence of remains of this species on Molokai when it was described by me from Lanai examples. In 1902, I again visited the spot where this beetle must formerly have existed in countless numbers and examined the fragments, but

found no living specimens either there or in neighboring localities more suitable for the beetle, judging by its habits on Lanai. It is clear that *sordidus* is a member of a group of closely allied species, this group including *lanaiensis*, a rather doubtful species, *lahainae*, *mutatus* and *alternatus*, and no doubt it will be increased by further discoveries. I think the last named certainly belongs to this group and has no near relationship with the Kauai *depressus* and *vittatus* as Van Dyke supposed, but is far removed from these in the Hawaiian series.

I have lately re-examined a pair of *R. sordidus* and noted some details not given in the original description, but which have since been found to be of importance. The pseudepipleura of the elytra sometimes exhibit small areas of denser setae (usually towards the apex), forming slight maculations. The outer side of the femora bears a conspicuous band of dense hair towards the apex, the narrow apical part and all the basal part being much more sparsely clothed with finer hairs. The basal ventral segments of the abdomen in the male are copiously and coarsely punctured, the third is flat, closely and rugosely punctured, the fourth tilted, with rugosely, but more finely punctured surface, the fifth conspicuously hairy, while the two preceding are only sparsely so. In the female the third and fourth segments are strongly tilted, shining, rugose-punctate, with fine and not dense hairs, the fifth more densely clothed than these.

Rhyncogonus freycinetiae Perkins

A single male in Mr. Giffard's collection, dissected by Sharp (R. 18), captured in dead leaves, 25-VII-08, by Kuhns is, I have little doubt, the male of *freycinetiae*, described from a single female taken by myself in the same locality (Halemano, Oahu) in the debris which collects at the bases of the leaves of *Freycinetia*. At the time I was collecting land-shells, and only came across the beetle by chance. From this male it appears that the apical ventral segment is very hairy, the preceding one is also quite hairy but more densely at the sides, while the first of the two small intermediate segments bears for the most part very inconspicuous hair, except at the sides, its surface being copiously punctured, the punctures not very different from those immediately in front of it (i. e. at apex of second segment) though somewhat finer.

Sharp gives the measurement of this insect as scarcely 6 mm., but measured as were the species described by me I find the length (including the rostrum) more than 7 mm. A difference

of 2.5—3 mm. in length is common in individuals, of some species of the genus, but more than this is exceptional and one may presume that either the single male is much under the average size or the single female exceptionally large. One batch of *R. nitidus,* however, contained individuals differing by 5 mm. in length!

Rhyncogonus koebelei Perkins

Dr. Sharp has rather misunderstood my remarks (F. H. III, p. 653) on the distribution of this species, as I did not find it "plentiful in the Manoa Valley" but it occurred on the dividing ridge between Manoa and Palolo and in the latter valley and still further southeast. I did not find it at all in Pauoa or Nuuanu and suppose it is represented on the other side of the latter valley by *R. obsoletus* here described. My statement "common," of course, referred to *koebelei* as compared with many other species of the genus to which it belongs. I found it could be obtained in its special localities with certainty, if specially looked for, though I never myself found many specimens on any one occasion.

Rhyncogonus oleae Perkins

I submitted specimens of this species with others to Dr. Sharp at the time when he was working at Mr. Giffard's specimens, and on the label of a male he wrote "near *sordidus,*" but did not dissect it. One, which I myself dissected, has the median lobe so like that of *R. mutatus* and *sordidus* that I doubt whether this character is likely to be of much help in separating closely allied species. The closely, coarsely and deeply punctured pronotum, generally having the surface between the punctures smooth and shining, as well as various other characters will easily separate *oleae.*

I have few specimens now of this species, which I found in fairly large numbers in several localities in the Koolau range, but in the original description considerable variability was indicated and it is just possible that some individuals may have belonged really to *R. mutatus.*

Rhyncogonus saltus Perkins

Described originally from a single and not very fresh female, I have now examined a small series of specimens captured by Mr. Swezey in the original locality. There is considerable variation in size and in details of structure. The pronotum in some examples is not evidently shining between the punctures, and the median line may be abbreviated. In very fresh examples the pronotum is less sparsely hairy than in the type, and the scutellum has a tuft of pale setae at the apex forming a pale spot. The clothing on the outer surface of the hind femora sometimes forms a more or less definite anteapical band. In the male the third ventral segment is closely or at least copiously punctured, but less strongly than the preceding, the tilted fourth segment has its surface closely punctured, but neither of these are densely hairy as is the apical segment. The pronotal sculpture in this small species is unusual and bears some resemblance to that of such Kauai species as *vittatus* and *kauaiensis*.

The median lobe of the aedeagus is rather stout and strongly curved, the narrowed apical part hardly perceptibly curved upwards as a whole, when viewed laterally, the tip itself not turned up.

The type is in the collection of the Hawaiian Entomological Society.

Rhyncogonus fuscus Perkins

When describing the original specimen of *saltus*, I overlooked the above species from the same mountains. I have since specially visited the British Museum to examine the type, which is quite distinct from *saltus*, the funicle joints of the antennae being much longer. Its thorax is dull, with large and remote deeper punctures, between which are finer and shallower ones, the whole system being subrugose. The scutellum is hardly noticeable, scarcely penetrating the base of the elytra and is without clothing.

CERAMBYCIDAE

Plagithmysus forbesii sp. n.

Hind femora with the thickened part long, narrow, almost parallel-sided as in the majority of species. Elytra with the pale sutural lines of pubescence each bifurcate in front to enclose a triangular area of dark color, different from the rest of the surface, and in part of these areas is a dense patch of dull orange-yellow hairs. Head mostly red; pronotum mostly black, ground color of elytra reddish brown; femora, except the pale bases, dull dark red, almost black in parts.

Face with a broad band of pale hair on either side of the median line, narrower behind the antennae, then divergent to form a slightly interrupted transverse band in front of the vertex; the space between the eye and mandible similarly clothed. Antennae rufotestaceous, the basal joint darker. Pronotum with the median crest well elevated and in parts rufescent, with a very definite whitish-yellow vitta on each side of this, the two vittae being together about as wide in the middle (where are small yellower hairs) as the space between them; on each side

below these vittae is a wider one of dense dull orange color (widest in the middle) and again beneath this a narrow pale vitta connected with the preceding by a narrow line both on the front and on the hind margin of the pronotum; pleura densely clothed almost throughout with orange hairs or tomentum; the abdominal segments at the sides with a dense pale band. The elytra on the basal part have a very rugose sculpture, on the dark triangular areas it is finer and excessively dense, outwardly to the pale pubescent lines the surface is comparatively smooth, with the punctures coarse and somewhat deep. On the basal side of each of the triangular dark areas is a large irregular patch of dull orange-yellow, and in front of this are small flecks of pubescence some white and some orange-yellow, while along the lateral margins there is a fine line of white hairs. The hind tibiae are clothed with dense, reddish golden bristly hairs, the tarsi with dense, almost white ones. Length about 14mm.

This beautiful species of which I have seen only one specimen, a female, is, I think, clearly allied to *P. simplicicollis* Sh. but is very distinct; some of the details I have described may of course not be constant in all specimens.

Hab. Kauai: in the Alakai Swamp, 7—VII—1917 (C. N. Forbes).

Type in collection of the Bishop Museum, Honolulu.

Plagithmysus paludis sp. n.

Hind femora with the thickened part long, narrow, nearly parallel-sided as in the majority of species. Elytra with the pale sutural lines of pubescence each bifurcated in front and enclosing a dark triangular area, differing from the rest of the surface, in front of these the whole basal part is somewhat uniformly and sparsely clothed with very short, pale hairs.

Head and thorax of a dull dark brown color, nearly black; face with pale pubescent band on either side of median groove, between the antennae becoming a median band, which apparently becomes dilated towards the vertex (but perhaps abraded in the type) and with a dense spot in the sinus of the eye; antennae brown. Pronotal crest not at all strongly elevated and very wide, somewhat scabrous or with some small elevations in front and with two very distinct transverse raised lines behind the middle; in front it forms a process which extends in front of the thoracic margin and in this particular specimen is asymmetric. The pale ochraceous vittae on either side of the crest are narrow, but very definite and dense, and, at a space about equal to the distance between these, on each side of the thorax is another narrow vitta, apparently less dense and distinct, beneath which the sculpture is coarser and less excessively dense than that above it; mesopleura with a dense white spot; metapleura with a dense yellow one in front and a white one behind, the former continued across the metasternum. Elytra dark brown, the elongate triangular spots in the furcation of each of the pubescent lines darker than the general color, all the surface on the basal side of these is sparingly and nearly uniformly clothed with short pale hairs, continued

back along the lateral margin as a narrow line to the apex, and also as a line between the marginal one and the furcate sutural one for about half the length of the latter. The sculpture of the basal part is rugose-tuberculate, behind the furcation of the pubescent lines it is more rugose-punctuate. Abdominal segments at the sides with spots of dense white pubescence, forming a practically continuous line on each side. Legs dark dull red, the stalk of the femora much paler or testaceous, the hind tibiae clothed with fuscous, the tarsi with dense yellow or white hairs. These hairs have been wet and may be discolored on the right leg and are missing on the left leg which has been bitten off at the femora by some predaceous creature. Length about 18 mm.

Hab. Kauai: Alakai Swamp, July, 1917, a single specimen (C. N. Forbes). This sombre species except in the pattern of the elytra differs greatly from the others which resemble it in this respect, not only in color but also in many points of structure.

Type in collection of Bishop Museum, Honolulu.

Plagithmysus kohalae sp. n.

Head dark obscure red, the pronotum darker almost black, the elytra with a large subsemicircular basal area and most of the down-turned sides fulvotestaceous, the rest of the surface dark brown or blackish; the pubescent lines along the suture ochraceous, very definite and distinct to the point where they diverge when they become confluent with a great area of similar pubescence which occupies the whole basal part of the elytra except the sides. Hind femora as in most species, the upper and lower sides of the thickened part subparallel for most of its length, the thin base yellow, the middle part red, the apex black. Pronotum with distinct and definite white vittae.

Head dark, dull red, the antennae less dark, the face not very densely clothed with pale pubescence. Pronotum almost black or pitchy; the crest seen from the side well elevated throughout, its upper outline rough, in dorsal aspect wider than one of the two distinct white vittae bordering it, and with a sharp, transverse, shining keel in front, and one still wider posteriorly, between which and behind the latter the surface is scabrous; the sublateral vittae are also quite definite and just beneath them the surface becomes smooth, but, owing to microscopic surface sculpture, not much shining; coxae pale, yellowish, the meso- and meta-sterna more yellowish brown; scutellum dark, clothed with dense white hairs; metepisterna sparsely clothed with very fine hairs, but at the apex the pubescence becomes coarser, dense and conspicuous. Elytra very densely punctured on all the basal part and along the sutural pubescent lines, but the parts exterior to these are polished and remotely punctured. Hind tibiae with dark, the tarsi with pale yellowish hair. Abdomen beneath very little punctured and sparsely hairy, apparently with a line of appressed white pubescence at the extreme sides, except on the last segment, but not very distinctly seen in this specimen. Length about 12 mm.

The single example is no doubt a female and is closely allied to *sulphurescens* Sh. and *giffardi* Perk., especially to the former, but is easily distinguished by the uniform clothing of pale pubescence that covers almost the whole upper surface of the basal part of the elytra in front of the similarly colored pubescent lines along the suture. It would be interesting to know whether this species and *sulphurescens* have the same dimorphism in the clothing of the hind tibiae, as is seen in *giffardi*.

Hab. Hawaii: Kohala Mountains, 3—IX—1919, on the upper Hamakua ditch trail (Swezey). Type in collection of Hawaiian Entomological Society.

Plagithmysus longicollis sp. n.

Red, with testaceous elytra and dark red thickened part of the femora: pronotum narrow, subelongate, not rounded at the sides, widely clothed in the middle for its whole length with white pubescence but with the elevations of the crest bare, the sides for a large part smooth and impunctate. Elytra with the sutural lines represented by flecks of white hairs, and with sparse small flecks or single white hairs on the basal part, but in general almost bare.

Face sparsely hairy, perhaps somewhat abraded, antennae wanting, except the basal joints of one side, the scape being almost black on its outer side, the following joints testaceous. Median crest of the pronotum narrow, almost cariniform in front, decreasing in height towards the posterior elevation, which is broader; when seen in profile the upper edge of the crest is denticulate from the asperites of the surface; the most elevated parts are free from the white pubescence, which forms a large area, and except on these elevations occupies all the middle of the pronotum; the sculpture on either side of the pubescent area consists of excessively dense punctures, becoming sparser below and still further below the surface is smooth and impunctate; scutellum margined with white hairs, and a dense white spot at the apex of the metepisterna above the hind coxae, and some white hairs at the extreme sides of the intermediate ventral abdominal segments, forming a line. Elytra shining, coarsely, deeply and rugosely punctured, the punctures becoming shallow and less definite, more rugose, towards the apex. Hind femora dull red above, almost black at the sides, the pale stalk of these and that of the intermediate femora considerably more than one third of the whole length; the tibiae with dark, the tarsi with dense white hairs. In this specimen the last visible abdominal segment is distinctly emarginate. Length, 11 mm.

Hab. Maui: Halehaku, June 24, 1920 (E. H. Bryan, Jr.); a single imperfect specimen, perhaps somewhat abraded and apparently a male. Type in collection of Bishop Museum, Honolulu.

Plagithmysus sharpianus sp. n.

General color red, the stalk of the femora pale yellowish, the pronotal crest broad and greatly elevated, clothed with extremely short black hairs, so as to form a large oval, dark reddish-brown spot, contrasting greatly with the rest of the surface which is clothed all over with pale ochraceous appressed hairs, except for a small glabrous lateral line or spot in the male, the female not being known.

Face except the median line clothed all over with pale yellowish hair: antennae with moderate development of the black setae on the more basal joints. Pronotal pattern in dorsal aspect somewhat like that of *P. elegans* or some specimens of *C. microgaster*, but with the sides of the pronotum almost entirely covered with pale hairs, though the vittae bordering the median crest are more dense than the covering below them· meso- and metasterna and the pleura clothed with pale depressed hairs, with a denser and yellower spot at the apex of the latter quite evident. The elytra in front of the darker yellow pubescent lines are rather evenly clothed with pale yellowish hairs, the sculpture being a rough and dense, but not very coarse, puncturation; the pubescent lines are very definite, both the suture, the space betwen their divergent ends, and the surface along their outer margins being all more or less darkened Though slightly less hairy than the basal part, the rest of the elytra is almost evenly pubescent and densely, rugosely punctured. The abdomen has a dense whitish band at the sides of the second, third and fourth segments, but the first has no trace of this. The hind tibiae are densely clothed with black, the tarsi with white hairs.

This species has the short basal stalk and the long nearly parallel-sided thicker part of the hind femora, as is usual in *Plagithmysus*. It is probably most nearly related to *P. kuhnsi* of Oahu. Length, 11 mm.

Hab. Kauai: Kumuwela, August 16, 1925; a single male bred from a dead branch of *Pipturus* by Mr. O. H. Swezey and in perfect condition. I have named this species after the late Dr. D. Sharp, to whom Hawaiian entomology owes more than to any other man. Type in collection of Bishop Museum, Honolulu.

Plagithmysus molokaiensis sp. n.

Hind femora of the same form as in *Callithmysus*, dilating gradually to near the apex from the pale basal stalk, but much less robust: the tibiae are much less densely clothed than those of *C. koebelei*. General color reddish, the pronotum often more or less infuscated and the elytra more yellowish brown, their pubescent lines distinct dull yellowish and divergent in front of the middle, bordered within the angle formed by their divergence and often also along their outer margin with black, densely and rugosely punctured over practically their whole surface.

Face with moderately dense pubescence on either side of the bare middle line, and with a dense spot in the sinus of the eye; the antennae red and only moderately bristly. Pronotum not at all wide, the sides not or hardly rounded, the median crest wide, scabrous, the sublateral

ridges on either side of it entire and curved, so that the middle of the pronotum between these forms a subovate area; between the median crest and sublateral ridges there is usually a more or less distinct pale pubescent vitta, but when this is entirely absent the pronotal pattern resembles that of *C. koebelei*, since the sides exterior to the sublateral ridges are clothed with pale subflavescent pubescence and bordering these have a very dense puncturation; scutellum usually with dense pubescence round the margin, the metepisterna with a dense apical spot. The flavescent lines of the elytra are much as in *kuhnsi* and *sharpianus*, but paler, and the furcation less wide, while the sculpture is like that of these species; on the basal part as far back as the basal extremities of the pubescent lines there is a general clothing of moderately dense, pale hairs, but the sides from behind the humeral angles are bare or nearly so; there is no special development of hair on the femora and that on the hind tibiae is neither specially long nor dense, much less so than in *Callithmysus* proper, or in fact than in *P. sharpianus* or *kuhnsi*. The ventral segments of the abdomen are very sparsely and obscurely punctured, the intermediate ones bear a dense lateral line or patch of pubescence. Length 9-12 mm., including tips of wings 2-3 mm. more.

Hab. Molokai: Kamiloloa, 3,200 feet, larvae in dead *Pipturus*, 20-XII-25. I have examined 8 beetles bred from these larvae by Mr. Swezey. Type in collection of Bishop Museum, Honolulu.

Plagithmysus muiri sp. n.

Head, pronotum and elytra black, the latter with a large, roundish, fulvotestaceous basal spot on either side of the scutellum, and a definite stripe of the same color towards the lateral margins along the whole length of these, these stripes connected at the base with the basal spots. Pronotum in dorsal aspect with the sides diverging towards the base for about two-thirds of their length, where they are armed with a large triangular projection, and thence narrowed to the base. Hind tibiae for the most part densely clothed with black hairs, but at the base with conspicuous white ones like those of the tarsi.

Black, the antennae and legs red and more or less of the underparts of the body, though the latter is generally for the most part infuscated. Face with white or whitish hairs, a band of yellow ones on either side of the median line beneath the antennae, a yellow spot in the sinus of the eyes and another behind these on either side of the vertex. Pronotum with the median crest forming a greatly raised prominence in front and behind, between which it is not or hardly evident; exterior to the posterior prominence and on the same line transversely there is on either side a strong blunt prominence representing the posterior end of the sublateral ridges, which are otherwise obsolete, or very little developed; still more outwardly on either side are the other two large triangular prominences, which have been mentioned above as forming part of the lateral outline when the pronotum is viewed from above. The vittae on either side of the median crest are distinct and formed of yellow hairs in some specimens, but in others may be only indicated by some yellow or orange hairs at the posterior end of the pronotum, or yellow hairs may be entirely absent, the parts adjoining the crest being clothed with

whitish pubescence which is not dense enough to form definite vittae; sometimes sublateral vittae are also quite evident being formed of orange-colored hairs, but these also may be absent or hardly at all developed; scutellum narrowly bordered with pale hairs, and in front of this on either side of the stridulating area there is a dense yellow spot, as also on the mesopleura and at the posterior end of the metapleura, as well as at the extreme sides of the ventral abdominal segments, where a complete line is formed on either side so far back as the last exposed segment, which itself is without this marking. The color of the elytra has been dsecribed above; the usual pubescent lines are distinct and vary in color from pale ochreous to a brighter yellow, their point of divergence is well in front of the middle of the length of the elytra; along the whole length, within the lateral margins of these, there is a line of yellow pubescence, and this is connected basally with the similar hairs which form a broadish band around the basal fulvotestaceous bare spots. Apart from these pubescent markings the surface is practically bare except for a narrow extension of the yellow lines forward along the suture from the point where they diverge and is very densely and rugosely punctured all over. The hind femora are in form like those of many others of the genus, very long, and less incrassated than in many of the species so characteristic of Oahu (e. g. *pulverulentus*, *solitarius*, etc.) the hind tibiae very densely and conspicuously hairy, as also are the tarsi. Length (including exposed part of wings), 13-17 mm.

One of the most interesting and remarkable of the endemic Longicorns, this species will probably at some future time be considered generically or subgenerically distinct. The pronotal structure is very abnormal and in some respects recalls features exhibited only by **Nesithmysus*, while the hind tibiae remind one of characters seen in the Oahuan *Callithmysus koebelei* and *P. kuhnsi*.

I have named this extraordinary species after Mr. F. Muir, whose careful study of the endemic Fulgoroidea is of the greatest interest to all those concerned with the problems presented by the Hawaiian fauna.

Hab. Oahu: Waianae Mountains; the larvae were discovered by Mr. Swezey and Dr. Williams feeding in and beneath the bark of an almost dead tree of *Sideroxylon* at the base of Kaala (2,000 feet) on November 11, 1926, and the five examples sent issued December 15-24. Type in collection of the Hawaiian Entomological Society.

* Mr. Swezey had remarked on this character in his letter which accompanied the insect.

Plagithmysus varians Sharp.

In his original description (Ent. Mo. Mag. 1896, p. 245) Dr. Sharp described three varieties of this species, the third being distinguished by the presence of a black area in the furcation of the white pubescent lines of the elytra. Subsequently (Fauna Haw. II, p. 100, 1900) this variety was referred to the newly described *lamarckianus*. No special remark was made on the color of the antennae of the variety of *varians*, which are described as "black" in *varians* and red in *lamarckianus*. It is evident that there were very few of this third variety of *varians* in the original series, but, later, when enumerating the specimens of *lamarckianus* (sent with these) thirty-three of the latter are mentioned. I think some confusion must have arisen in the matter and that the variety of *varians* in question, which I had placed with the rest of a large series, was truly that species and not *lamarckianus*. After the publication of his paper in Ent. Mo. Mag., Sharp wrote to me that the box, in which the series of specimens which I had separated as being attached to urticaceous trees, had been overlooked. Consequently *lamarackianus* was described later than the other species that were obtained at the same time. Whether the original specimens of the *varians* var. were distributed as *lamarackianus* I do not know.

I have gone into these details because amongst some *Plagithmysus* sent for my inspection by Mr. W. M. Giffard there is a specimen collected by him at Kilauea—presumably on Koa, as otherwise the tree would have been noted—and another small and imperfect one from "Kulani Hill, Olaa, 5,000 feet, on ?(Mackenzie)" which could well be referred to this rare variety.

Plagithmysus newelli Sharp

A single specimen of the female, somewhat immature, the hind tibiae not yet fully straightened out, agreeing well with the original description of this species, has been sent for inspection by Mr. Giffard. It was captured in July, 1913, but unfortunately there is still no record of the tree to which it is attached. The original specimen a straggler, obtained in Wailuku, had, I suppose, been accidentally carried down from neighboring Iao Valley, but the locality of Mr. Giffard's specimen, which was from the Awahi forest on Haleakala at 4,000 ft., renders this unlikely.

Callithmysus Sharp

As new species of the native Longicorns become known the limits of the three genera of Plagithmysini recognized by Dr. Sharp become more and more difficult to define. At present I consider it advisable to restrict the above named genus to *C. microgaster* and *C. koebelei*, which remain, in the combined character of the form of the hind legs and their clothing, entirely distinct from any species in the allied genera. These two species are confined to Oahu and it is evident that other Plagithmysi found on this island tend more or less to approach *Callithmysus* and differ considerably from most of the species, which one finds on the other islands. *P. cristatus,* referred finally to *Callithmysus* by Sharp does strongly approach that genus, but it is certainly somewhat closely allied to *pulverulentus* (the type of *Plagithmysus*) and in a less degree to other species. A few Maui species also show a tendency towards the structure of *Callithmysus*, or at any rate to that of Oahuan *Plagithmysus*. The recent discovery of *P. molokaiensis* described above presents us with a species having the hind femora shaped as in *Callithmysus*, though less robustly formed, but entirely lacking the remarkable vestiture. At present I prefer to place these dubious forms in the sufficiently heterogenous assemblage of species called *Plagithmysus* and to leave *Callithmysus* as a really definite genus on the characters I have mentioned.

Paraclytarlus subgen. n.

Under this name it is convenient to separate certain species which agree neither with *Plagithmysus, Neoclytarlus,* nor *Callithmysus* in characters. At present these can be considered as a subgenus of either of the two former or even of the latter, but will probably themselves be considered a good genus when a total revision of the Plagithmysini becomes desirable. At present, seeing how the addition of new species has rendered the definitions of the three above-named genera unsatisfactory, it is advisable to await a nearer completion of the collection of the whole series of Hawaiian forms that must exist before a new monograph is attempted.

The species I assign to *Paraclytarlus* are rather small but heavy-looking members of the tribe, their color being wholly or for the most part red or rufotestaceous, the club of the hind femora strongly

elongated, but quite unlike the oblong or subparallel-sided one of most *Plagithmysus* and in fact resembling that of some of the species referred to *Clytarlus* by Sharp. The hind tibiae have only short or inconspicuous clothing, but the tarsi are copiously clothed with hairs in the same way as *Plagithmysus* or almost so. The thickened part of the hind femora is clothed with short, hardly noticeable hairs, without any dense accumulation of appressed pubescence or any special pattern or adornment. The abdomen is without conspicuous dense lines or spots of hair beneath at the sides and, if I am correct as to the sex, is well-developed in the male, with the base at most a little sunk below the metasternum, when the insect is viewed with the venter up. The pronotum in the known species is short and appears practically bare, though under a very strong lens it may be seen that excessively short hairs are present, or there may be a few very slender long ones, but there is no trace of vittae or ornamental clothing.

P. timberlakei may be considered the type of the subgenus, and *C. abnormis* Sh. is probably very closely allied to this, while *P. pipturicola* can be placed with these and possibly also *C. laticollis* Sh. *C. annectens* Sh. is perhaps nearer *Plagithmysus* s. s. All the species are described on single specimens; *abnormis*, however, through some mischance, as I met with several specimens in the one known locality and I do not know what became of the others.

Paraclytarlus timberlakei sp. n.

A red species, with the antennae for the most part, the basal part of the femora, the tibiae and tarsi paler, or testaceous; elytra with a distinct line of white pubescence on each side of the suture on about the apical two-thirds of their length and a patch of white hairs at the base between shoulders and the scutellum, the latter also conspicuously covered with depressed white hairs.

Pronotum short, dull, with very dense sculpture of fine rugulose puncturation, and with extremely short hardly noticeable hairs; viewed in profile, the crest is represented by a rather strong, conical elevation in front and one of about equal height behind, but this is more rounded above, though somewhat pointed anteriorly. The part between the elevations is free from transverse raised lines or asperities, while there are two feeble transverse lines on the posterior prominence. The sublateral prominences or ridges are feebly developed and beneath these the sides of the prothorax have about the same sculpture as above. There is a dense spot of white pubescence at the apex of the metepisterna, conspicuous to the naked eye, but otherwise this part is inconspicuously clothed. The elytra are densely but not coarsely punctured, and on the apical part more finely than in front of the basal extremity of the white sutural lines. Of the hind femora the thin base thickens gradually towards the club so that there is no definite division between them, but the latter may be considered as longer than the stalk.

Length to tip of elytra about 11 mm.

The single specimen of *P. timberlakei* bears a label "*Neoclytarlus* n. sp." written by Mr. Timberlake, who collected it, and recognized it as new. I have named the species after him. His extremely valuable work on the Hawaiian Hymenoptera, and particularly on the Chalcidoidea, has greatly advanced our knowledge of this section of the fauna. In Sharp's arrangement the species would naturally have been placed next to *Neoclytarlus (Clytarlus) abnormis.*

Hab. Oahu: Mt. Olympus; a single specimen on Ohia lehua in 1916 (Timberlake). Type in collection of Hawaiian Entomological Society.

Paraclytarlus pipturicola sp. n.

Red, the elytra more yellowish brown, the apical part of the femora dull dark red, almost black; antennae, tibiae, base of femora and the tarsi testaceous; abdomen dark brown beneath, blacker basally. The elytra have traces of pubescent hairs along the suture from the apex to about the middle, but these lines are indicated by sparse hairs in the unique specimen and are very indistinct, possibly more or less abraded. At the base there is a short but distinct patch of pale hairs on either side towards the shoulders.

The pronotum is short, and under a strong lens appears quite bare except for a few very slender long setae; seen from the side, the anterior prominence, representing the median crest, has its front side more straightly erect than in the preceding species, but the posterior prominence is much less strongly raised and not at all conical; in dorsal aspect the transverse raised lines or asperities of the surface are not very distinct, but though chiefly developed on the anterior and posterior median elevations yet the part between is not altogether devoid of these asperities; the general sculpture of the whole pronotal surface is a very dense rugulose puncturation. The scutellum is densely punctured, but in the unique specimen there is no noticeable pubescence. The elytra are very densely, rugulosely punctured all over, more finely on the apical parts than basally. The hind femora have a very long club developing gradually from the slender base, much as in some *Callithmysus* but with the outline less sinuate; hind tibiae with short and comparatively inconspicuous hairs, the tarsi well clothed with white ones. The metepisterna appear to be regularly clothed with short pale hairs not dense enough to conceal the surface and have no spot or area of dense clothing.

The single specimen is probably a male and bears a written label "*Callithmysus* n. sp. (?)". The hind femora bear considerable resemblance to those of that genus, but the inconspicuously clothed tibiae as well as other characters are foreign to it, while the species is equally discordant if placed in *Neoclytarlus* or *Plagithmysus.* Length about 12 mm.

Hab. Maui: Kailua, June 14, 1920, on *Pipturus* (E. H. Bryan, Jr.). Type in collection of Bishop Museum, Honolulu.

Paraclytarlus podagricus sp. n.

General color reddish as in the allied species, the elytra with an evident but not very definite line of pale flavescent pubescence on either side of the suture, these lines being somewhat expanded anteriorly to form a more or less evident patch near the middle of the wing cases, and then a little further produced towards their base; midway between this basal dilation of the pubescent lines and the lateral margin opposite, a few similar hairs form a short line or marking, probably easily denuded, and very likely to be variable in size and not always present. Hind femora very strongly clavate, the thin stalk subparallel-sided for about one-third of the whole length, then gradually dilating into a very wide club.

Head blackish red, darker than the pronotum, sparsely hairy; pronotum very densely punctured, appearing glabrous except for a few extremely fine, long setae in dorsal aspect, but seen in profile under a strong lens a clothing of very short, erect hairs is evident; in this view the median crest appears as a triangular elevation in front, but is very little raised posteriorly, the posterior elevation in dorsal aspect being wider than the anterior one and marked in front by a curved raised line, but other such lines are not or hardly to be seen; the sublateral ridges are not much developed, forming in some aspects a pair of rounded tubercles on either side; scutellum dark, with hardly visible pubescence; the metasternum is thinly pubescent, the metepisterna with a dense patch at the apex. Elytra densely, subrugosely punctured, apically the punctures are less dense, finer and feebler than on the basal parts; apart from microscopic hairs the surface appears glabrous under an ordinary lens, except for the pubescent pattern above described, and a scanty pubescence just within the shoulders. Abdomen beneath shining, sparsely and feebly punctured, without any hairs or spots of dense pubescence at the sides. The hairs of the hind tibiae are neither dense nor long, but the tarsi are well clothed, with much more conspicuous white ones. Length about 10 mm.

Hab. Hawaii: Kohala Mts., 2-IX-1919, on the upper Hamakua ditch trail (Swezey). One specimen, which I believe to be a male. Type in collection of Hawaiian Entomological Society.

Neoclytarlus pulchrior sp. n.

Of this species I have seen only a single female. Head and thorax and the underparts of the body black; elytra and the dark parts of the femora blackish brown, the former paler in parts, especially at the base, the latter pale yellowish on the basal part, the antennae dark brown. One of the larger species of the genus, the pronotum on each side of the middle with a moderately well defined pale vitta, these being connected with less dense white hairs in front and behind. Elytra with a great deal of depressed, rather coarse, white hair, and with ill-defined bare spots, so that the pubescence is broken up into irregular flecks and some larger ones. Hind femora with elongate gradual club; the abdomen beneath without dense lateral hair spots.

Face not at all densely hairy, except for the spot in the sinus of the eye. Pronotum in the middle between the vittae, as seen in profile, very little raised either in front or behind above the part that lies between; in surface view it is traversed in the middle by a number of transverse carinae, most of those in front being broken or irregular, while between these and the posterior carinae there is a non-scabrous and hairless interval. There is a feeble development of another pair of vittae, external to those already mentioned, and almost obsolete in front; the metepisterna are sparsely hairy, except for a dense white spot at the apex. Elytra somewhat shining, to the naked eye there appears on each side behind the middle a bare dark spot; the sculpture is rugose with very dense punctures, which apically are less impressed and definite but cause rugosity of the surface. The dark club of the hind femora on its outer surface is only densely hairy at the apex and comparatively sparsely so towards the base, differing in this respect from *N. pennatus* and various other species. Length 10 mm.

There was no locality label* to this specimen, but only a number. Type in collection of Hawaiian Entomological Society.

Neoclytarlus fugitivus sp. n.

The *facies* of this medium-sized and rather robust species is much like that of *Paraclytarlus*, but the tarsi are less conspicuously clothed, and the hairs are subfuscous, not white.

Rufescent, the antennae, elytra, tibiae and tarsi, paler testaceous, the club of the hind femora long and gradual. Pronotum broad, not or hardly pubescent above, without vittae, the crest not specially raised above the general convexity of the surface, but marked by transverse raised lines and scabrous points between these. Elytra densely, deeply, coarsely, subrugosely punctate, across the middle with quite conspicuous flecks of pale pubescence, but with comparatively little pubescence either behind or in front of this area.

Pronotum dull, covered with dense but not deep punctures, so that the surface between them is so reduced as to appear reticulated; the crest with a well-developed transverse carina in front and another towards the posterior end, between which and behind the latter are other small or incomplete elevations. The thorax beneath is nearly black and fairly well clothed with pale hairs, which are evenly distributed over the metapleura; the scutellum has pale hairs round the margin. Elytra with the surface shining between the coarse punctures, the pubescence of the middle area placed more or less in depressions of the surface and with numerous roundish impressions towards the apex, but these do not bear flecks of pubescence. Abdomen with pale hairs beneath which become more dense towards the sides, but not so much as to form a distinct pattern of lines or spots. The club of the hind femora is gradual and longer than the thin basal stalk.

The single example I have examined is probably a female, and it is possible that it may be the other sex of *C. laticollis* Sh.

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* This specimen was found unlabelled among some miscellaneous specimens, and there was no way of determining who collected it or where, but as it was a fine specimen, was included with the others sent to Dr. Perkins for study. [Editor.]

Hab. Maui: Haleakala, 4,500 feet, Jan. 14, 1926; one specimen captured along the Kula pipe line (Swezey). Type in collection of Hawaiian Entomological Society.

Neoclytarlus smilacis sp. n.

A narrow rufescent species, the tibiae and tarsi and the antennae (at least basally) paler or testaceous, the elytra also tending to an obscure yellowish brown color. Hind femora widening very gradually at no great distance from the base, so that the club is very indefinite and the more so as the basal part of the femur is not of the usual pallid tint, but red. Pronotum widened at the middle, where the lateral outline, in dorsal aspect, is subangulated. Elytra coarsely, rugosely punctured, with some pale pubescence along the suture on more or less of the posterior half of their length and much more conspicuous and extensive in the female than in the male.

I have seen only a pair of bred specimens of this insect and these differ in the pronotal clothing, the male having a considerable and noticeable pubescence of a yellowish color on either side of the median crest, the female on these parts being practically glabrous, while, as noted above, it has much more elytral pubescence than the male. The posterior femora are of similar general form in both sexes (somewhat like those of *Callithmysus*) but considerably thicker in the male. The abdomen beneath is very shining and for the most part nearly glabrous, but at the sides in the female the intermediate segments have a line of short appressed, pale hairs, though these are hardly conspicuous enough to form a definite marking. Seen in profile, the pronotal crest is angulate in front and broadly rounded behind, concave between and scabrous, no doubt to a variable extent. The scutellum is black, without a pubescent marking or margin, and the metapleura bear only very short and inconspicuous hairs.

This species is very similar to *N. indecens* of which a single example was collected by Mr. H. T. Osborn in the Waianae mountains while it was subsequently bred from stems of *Smilax*, by Mr. Swezey. The material from Oahu was in poor condition, and although the food plant is the same, I do not think the above described species from Maui is the same. They do not belong to the genus *Neoclytarlus* in its typical form.

Hab. Maui: Waikamoi, 4,500 feet; larvae collected in *Smilax* stems, January 14, yielded two beetles* on February 20, 1926 (Swezey). Type in collection of Hawaiian Entomological Society.

*Subsequently, 5 more beetles were reared by Mr. Swezey from *Smilax* from that region.—[Editor.]

Neoclytarlus fragilis (Sharp)

The original specimens collected by Blackburn were found near the head of Palolo Valley, where I have since taken the species, and it has occurred several times in the Waianae range. I find it difficult to believe that the form described by Sharp as *N. ultimus* can be really distinct, since both are attached to *Acacia koa* and certainly their range overlaps. *N. ultimus* in the larval state was found by Koebele and myself in the mountains about Tantalus and Pauoa in great numbers, so that it appeared to rank almost as an injurious insect. It also occurred in the Koolau range on the other side of Nuuanu. Apart from this consideration, I find that in the allied *N. obscurus* of Kauai, amongst the original specimens described, are individuals of the male differing in the abruptness and length of club in the same way that *fragilis* and *ultimus* are said to differ, and very similar variation occurs in other allied species, e. g. *N. nodifer* and *N. mediocris*. It appears to me that the difference in such cases is due to the fact that some males in the form of the hind femora more or less approach that which is normal to the females, and this is also often the case with many males in *Plagithmysus*. Specimens of the *ultimus* form, bred by Koebele, sometimes bear the name *fragilis* since they were so determined for him by myself and I also distributed similar specimens in various directions under this name, before *ultimus* was described. Such specimens are extant in a set of this beetle forwarded to me for examination by my friend, Mr. W. M. Giffard.

Nesithmysus swezeyi sp. n.

Head black, pronotum red with black markings, elytra testaceous; antennae and legs also rufescent, the femora with black tips; pronotum subglobose, very wide, the sides strongly rounded, wider across the middle than long, extremely densely, finely, rugulosely-punctate all over, except on parts of the dark colored elevations, glabrous to the naked eye. Elytra cuneate, short, about 2½ times as long as their basal width.

Face shining, irregularly punctured, sparsely clothed with pale yellowish hairs, the median impressed line distinct, starting from the base of the clypeal region, and continued between and behind the antennae at the bottom of the frontal sulcature; above the antennae the head is shining and strongly punctured, some of the punctures being much finer than others. Pronotum with the median crest represented by a blunt prominence in front, and a slightly raised, declivous, black-colored area behind, which like the dark part of the anterior prominence is coarsely punctate and shining; these prominences are connected by a very narrow ill-defined smoother line, noticeable amongst the dense and even punctura-

tion on either side of it; the sublateral crests are represented each by a black oblique ridge behind and a slightly raised line—on one side repre sented only by two small tubercles—in front; between the posterior ridge and the small anterior raised line there is a dark-colored mark and the surface is vaguely depressed, while the dark color extends backwards along a faint groove, so as to form a furcation where it diverges from the black posterior ridge; on the middle of the sides of the pronotum there is a small black shining tubercle, which in dorsal aspect can be seen to slightly interrupt the curve of the lateral outline and corresponds with the strongly prominent lateral angle of *N. forbesii* and the less developed one of *N. haasii.* To the naked eye the surface is glabrous, but there are some sparse and extremely fine hairs, visible along the sides in dorsal aspect with a lens, and others much shorter and more numerous. The mesosternum is black, the metasternum mostly yellowish-brown, the mesepisterna and metepisterna posteriorly have each a dense spot of appressed yellow hairs; the latter in front of this spot have only rather thin pubescence, the puncturation not being hidden. On the margin of the hind and middle coxae there is an incomplete ring or curved line of similar dense hair. The scutellum is densely clothed so as to form a yellow spot. Hind femora short, strongly clavate, increasing in width from rather near the base, shining, feebly and indefinitely punctured, sparsely clothed with short, fine hairs, the tibiae and tarsi with sparse fine hairs, the surface of the latter shining, not concealed by the clothing. Elytra shining, rugulose and copiously, but irregularly, punctured, so that the smooth spaces between the punctures are unequal, towards the apex the sculpture is less definite. The clothing is yellow and irregularly distributed, chiefly and rather broadly along the suture from near the apex to beyond the middle, where it widens outwardly towards the sides and thence is continued forward to the bare humeral prominences; along the lateral margins of the elytra, as well as on a considerable area at their base and apex, the surface is either bare or has only sparse scattered hairs. Abdomen beneath shining, with very sparse piliferous punctures, and with a spot of yellow hair on each side of the abdominal segments apically, except on the last exposed one, which is clothed with dark hairs apically, and slightly emarginate. Length to apex of elytra 18 mm., width of pronotum and of base of elytra approximately 5 mm. In the specimen examined the wings extend some way behind the tips of the elytra, which are very narrowly rounded or almost pointed, and not tightly closed along the suture. It is not clear to me how far the wings can be concealed beneath the wing-cases, when the insect is alive and at rest.

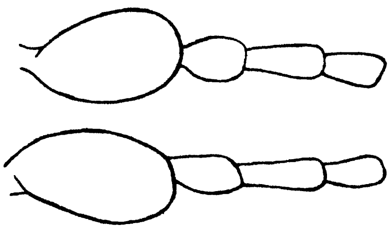
The species of *Nesithmysus* are all very distinct and different from one another so that some of the generic characters taken from the type species do not apply to more recently discovered species. As the species have a facies of their own and are easily recognized it does not seem worth while at present to remodel the generic characters, while, no doubt, other new species remain to be discovered. *N. swezeyi* is one of the most remarkable of Hawaiian insects.

Hab. Maui: Kula pipe line trail about 3 miles east from Olinda; a single specimen of doubtful sex bred from wood of *Pelea* by Mr. O. H. Swezey. The larva was found February 10, 1927, and the adult emerged on March 5.* Type in the collection of the Hawaiian Entomological Society.

Proterhinus miricornis sp. n.

Male; reddish-black or pitchy, but practically black in parts, the base of the femora, first and second joints of the antennae and the bases of the following, red, the tibiae and tarsal lobes also rufescent.

Head sparsely clothed with pale golden decumbent setae, dull, distinctly but not densely punctured, the front with a very distinct median impressed line, the rostral (or prae-antennal) portion very short. Antennae slender, about as long as the elytra, the scape long and large, ovate, dilating abruptly from the short, narrow, articulating pedicel, and as long as the two following joints together; second and fourth not differing much in length (but the former is stouter) and considerably shorter than the third; all the joints are elongate and the three-jointed club is slender and not at all abrupt, since, although its basal joint is considerably longer than the one preceding it, the latter is not very greatly narrower at its apex than the former. Pronotum strongly narrowed and constricted in front, sparsely clothed with depressed setae, except towards the sides, where they are dense enough to form evident, longitudinal, pale vittae; the surface roughly punctured and without evident rounded impressions,



Proterhinus miricornis First four antennal joints of right and left sides, seen in rather different positions.

though there is a trace of one on either side of the disc, appearing as a pair of dark spots in certain aspects. The femora are very robust, sparsely clothed with both appressed and erect pale setae, the tibiae with short erect white ones; the front tarsal lobes of moderate size, but very much larger than those of the middle pair of legs. Elytra with the humeral angles subrectangular, not acute nor produced; the pale appressed setae are mainly placed on the paler (redder) portions so as to form a maculate pattern, erect setae are inconspicuous, being very short, and

* A second beetle of this species issued from the same material on April 1st, but it did not happen to get sent to Dr. Perkins for use in the above description. From other pieces of *Pelea* wood and branches brought in from the same place, 4 specimens of *Nesithmysus forbesii* Perkins emerged from March 21 to April 6 On June 18, a fine specimen of this species was obtained from its pupal cell in a *Pelea* tree at the same place as above. (O. H. Swezey.)

sparse and white in color. The basal abdominal segment beneath is convex across the middle so as to appear impressed on its apical portion, in the middle of which the punctures are fine and indefinite, the apical segment has a very conspicuous and moderately deep, round fovea. Length about 2.5 mm.

This species has no resemblance to any other on Kauai; in the form of the antennae it bears some resemblance to such species as *podagricus* of Oahu, but these organs in the latter are conspicuously hairy, while in this species they appear to be very inconspicuously or sparsely so, apart from the differences in the joints themselves. The pronotum in *podagricus* has conspicuous impressions, the basal angles of the elytra are produced and its other differences are so great that it is doubtful whether the two can be really allied.

Hab. Kauai: Kumuwela, 1-VIII-25; a single male on *Campylotheca* (O. H. Swezey). Type in the collection of the Bishop Museum.

Note:—The descriptions of *Plagithmysus muiri*, *Nesithmysus swezeyi*, and *Proterhinus miricornis* are from material sent to Dr. Perkins at a later time, and, as they were received before going to press, have been incorporated here. [Editor.]

Notes on the Host Plants of the Species of Proterhinus in the Kokee Region of Kauai.

By O. H. Swezey

(Presented at the meeting of November 4, 1926)

In August, 1925, while spending a few weeks' vacation at Kokee, Kauai, the time was chiefly spent studying the insect faunas of the various native trees that were the prominent ones making up the forest of the region. The Kokee region is a plateau of about 3,700 feet elevation with numerous valleys that are the tributaries of the Waimea, above the canyon. It is a fine forest region having many kinds of native trees and many of them of more than the ordinary size. Numerous trails and a road to the intake of an irrigation ditch make it conveniently accessible so that it is a remarkably favorable place to make special studies in entomology. Within easy distance may be reached forests of the dry ridges towards the Na Pali coast, or in the other direction the wet forests of the Alakai Swamp towards the center of the island.

In pursuing studies of the insect faunas of the different trees, the bark beetles of the genus *Proterhinus* came in for a good share of attention. In many cases, large series of these beetles were collected from particular trees, and evidence obtained of their special habits and food-plants. Some, too, were collected from several different trees, indicating more general habits. In collecting these beetles, of course, some of them were collected in situ under bark or in the dead twigs where their larvae had fed. Others were collected by beating among dead twigs and branches. In doing this the beating was done on only one kind of tree at a time so as to avoid the possibility of getting the bettles mixed. Many of the trees were situated sufficiently isolated so that this could be readily done. Even then, there is no doubt but what beetles may sometimes get blown around, or have crawled onto different trees than their regular host trees. Records of individuals or a few specimens beaten from trees can not be of so much value in determining host relations as is the taking of a series of specimens from beneath bark, etc., especially when the larvae are also found in situ.

Some of this collection of *Proterhinus* were readily made out by comparison with the Bishop Museum collection of *Proterhinus*, but the whole lot was sent to Dr. R. C. L. Perkins in England for verification and for determination of the other and more difficult species of the lot. One new species was found, but only a single specimen of it was taken, beaten off Campylotheca. It is remarkable in having an enormously enlarged scape to the antenna. Some host records from a collection made in August, 1921, are also included.

Herewith the trees are listed with the species of *Proterhinus* taken from each:

TETRAPLASANDRA WAIMEAE. Ohe kikoola.

Proterhinus gigas Perkins.

A series of 14 specimens of this large species was collected from beneath bark of a large fallen tree. This was originally collected on Cheirodendron by Dr. Perkins. It is a tree of the same family, Araliaceae.

STRAUSSIA MARINIANA. Kopiko.

Proterhinus anthracias Perkins.

A series of 43 specimens was collected from beneath the bark of a large tree that had been felled by a roadside. The beetles were numerous as were also the larvae feeding in and beneath the bark. A series of 46 specimens was similarly collected in August, 1921.

Proterhinus maculifer Perkins.

Two or three specimens. A series of 15 specimens were collected from dead twigs, August, 1921.

Proterhinus amaurodes Perkins.

One bad specimen. This species was originaly collected from *Straussia* by Dr. Perkins.

WIKSTROEMIA FURCATA. Akia.

Proterhinus wikstroemiae Perkins.

A series of 13 specimens beaten from isolated small trees having numerous dead twigs.

SYZYGIUM SANDWICENSE. Ohia ha.

Proterhinus binotatus Perkins.

A series of 28 specimens obtained by climbing an isolated, much-branched tree of medium size, and beating among the numerous dead twigs and small branches.

ACACIA KOA. Koa.

Proterhinus dubiosus Perkins.

A series of 10 specimens beaten from dead twigs and branches. Five specimens were similarly obtained in August, 1921.

COPROSMA WAIMEAE. Olena.

Proterhinus angustiformis Perkins.

A series of 26 specimens obtained by beating.

Proterhinus basalis Sharp.

One specimen. Probably an accidental occurrence.

Proterhinus antiquus Perkins.

One specimen. Probably accidental.

ALYXIA OLIVAEFORMIS. Maile.

Proterhinus angustiformis Perkins.

A series of 23 specimens beaten from dense clumps of maile that were as much isolated as possible. Of course from the nature of this plant it depends for support on some other tree, and complete isolation is not possible.

Proterhinus amaurodes Perkins.

Two or three specimens. Probably accidental.

Proterhinus eulepis Perkins.

A few specimens.

GOULDIA ELONGATA. Manono.

Proterhinus basalis Sharp.

Nine specimens beaten from isolated small trees.

Proterhinus maculifer Perkins.

A few specimens. Probably accidental.

Proterhinus serricornis Perkins.

A specimen not quite like the cotype.

Proterhinus angustiformis Perkins var?

One specimen. Probably accidental.

SCAEVOLA CHAMISSONIANA. Naupaka.

Proterhinus basalis Sharp.

Seven specimens taken by beating. (Difficult specimens seem to connect this with *dubiosus*). A series of 25 specimens were taken similarly in August, 1921.

Proterhinus amaurodes Perkins.

Proterhinus maculifer Perkins.

One of the former and 2 of the latter. Probably accidental as these species belong to *Straussia*.

PIPTURUS ALBIDUS. Mamake.

Proterhinus eugonias Perkins.

Two specimens obtained by beating.

Proterhinus nigricans Sharp.

A few specimens obtained by beating. Four were similarly obtained in August, 1921.

Proterhinus deceptor Perkins.

A few specimens obtained by beating.

ELAEOCARPUS BIFIDUS. Kalia.

Proterhinus eugonias Perkins.

Four specimens obtained by beating.

OSMANTHUS SANDWICENSIS. Pua.

Proterhinus eugonias Perkins.

Two specimens obtained by beating.

CYRTANDRA

Proterhinus eugonias Perkins.

One specimen. Probably accidental.

MYOPORUM SANDWICENSE. Naieo.

Proterhinus difficilis Perkins

A small series beaten from dead branches of a few completely isolated trees.

ANTIDESMA PLATYPHYLLUM. Hame.

Proterhinus dubiosus Perkins.

Four specimens obtained by beating.

Proterhinus difficilis Perkins.

One specimen, agrees pretty well with cotype.

Proterhinus sp.

One female of *obscurus* group (probably would have been placed with *deceptor* in the "Fauna Hawaiiensis").

Proterhinus dubiosus Perkins.

A few specimens taken by beating.

CAMPYLOTHECA COSMOIDES. Poolanui.

Proterhinus serricornis Perkins var.

One large male.

Proterhinus eulepis Perkins?

One specimen in bad condition.

Proterhinus miricornis Perkins.

One specimen. Has greatly enlarged scape of antenna.

SUTTONIA SANDWICENSIS. Kolea laulii.

Proterhinus dubiosus Perkins.

Four specimens taken by beating.

Proterhinus basalis Sharp.

One specimen.

Proterhinus angustiformis Perkins var.

One specimen, same as on Gouldia.

LOBELIA

Proterhinus gigas Perkins.

One small male.

Proterhinus culcpis Perkins.

One male. Both of these species were in a dead hollow stem. Accidental.

BOBEA MANNII. Ahakea.

Proterhinus eugonias Perkins.

Several specimens taken by beating.

Proterhinus serricornis Perkins?

One specimen.

SIDEROXYLON SANDWICENSE. Aulu.

Proterhinus eugonias Perkins.

One specimen, probably accidental. One specimen obtained in August, 1921.

CRYPTORCARYA MANNII.

Proterhinus eugonias Perkins.

Proterhinus dubiosus Perkins.

One of each species, probably accidental.

CIBOTIUM CHAMISSOI. Hapu.

Proterhinus setulosus Perkins.

Four specimens, taken from the inside of dead stems of fern fronds.

LIST OF PROTERHINUS SPECIES WITH TREES FROM WHICH COLLECTED

The first tree mentioned could perhaps be considered proper host, except in some cases that are probably more or less polyphagus.

Proterhinus gigas Perkins. *Tetraplasandra.
*Cheirodendron, Lobelia.

Proterhinus anthracias Perkins. *Straussia.

Proterhinus eugonias Perkins. *Elaeocarpus, *Bobea, Osmanthus, Sideroxylon, Cryptocarya, Pipturus, Cyrtandra.

* The trees designated with an asterisk may be considered as true hosts, as more or less of a series of the beetles was collected from them. Those collected on the other trees listed may have been only stragglers.

Proterhinus basalis Sharp. *Gouldia, *Scaevola, Suttonia, Coprosma.

Proterhinus dubiosus Perkins. *Koa, Campylotheca, Antidesma, Suttonia, Cryptocarya.

Proterhinus difficilis Perkins. Antidesma.

Proterhinus eulepis Perkins. Alyxia, Campylotheca (?) Lobelia.

Proterhinus amaurodes Perkins. *Straussia, Alyxia, Scaevola.

Proterhinus nigricans Sharp. *Pipturus.

Proterhinus binotatus Perkins. *Ohia ha.

Proterhinus setulosus Perkins. *Cibotium.

Proterhinus antiquus Perkins. Coprosma.

Proterhinus wikstroemiae Perkins. *Wikstroemia.

Proterhinus serricornis Perkins. Gouldia, Bobea (?).

Proterhinus serricornis Perkins var. Campylotheca.

Proterhinus angustiformis Perkins. *Coprosma, *Alyxia.

Proterhinus angustiformis ? var. Gouldia, Suttonia.

Proterhinus maculifer Perkins. *Straussia, Gouldia, Scaevola.

Proterhinus obscurus. Antidesma.

Proterhinus deceptor Perkins. *Myoporum, Pipturus.

Proterhinus miricornis Perkins. Campylotheca.

With these notes as a basis, further collecting and study in the region is desirable to more accurately determine true host relations, and to eliminate so far as possible the factor of accidental captures, stragglers, etc. As seen from the above list of 19 species and 2 varieties, the host trees of 13 of the species listed have been quite definitely determined. The other species of the list were collected in such small numbers (often single specimens) that they should be considered as merely stragglers on the trees from which they were collected.

A New Tachinid Parasitic on Armyworms in Mexico

By C. H. Curran,

Entomological Branch, Ottawa, Canada.

Archytas cirphis n. sp.

Belongs to the *analis* group, in which the pleura are yellowish pilose, the thorax wholly pollinose and the abdomen shining black with the apical segment more or less distinctly pollinose. Length, 10 to 12 mm.

Male. Lower part of head yellow in ground color, wholly covered with white pollen; front aeneous, covered with greyish ochreous pollen, the frontal vitta rusty orange; upper portion of occiput pale ochreous pollinose. Pile of head whitish with yellowish tinge above. Upper two-thirds of front with stiff black hairs; three or four finer bristles outside the frontal rows below, orbitals wanting; inner verticals long, decussate, the outers much smaller and proclinate or directed obliquely backwards; a small bristle, of equal size with the postocellars, behind each vertical. Antennae brownish red, the third segment black; the first two segments usually largely infuscated, probably shining reddish brown in fully mature specimens. Front at vertex seven-eighths as wide as greatest width of eye. Palpi reddish, long, moderately broadened apically.

Mesonotum bronze-black, densely yellowish grey pollinose, the shining vittae extremely narrow; hair and bristles black, pleura with similar pollen to dorsum, clothed with fine yellow pile which also covers the notopleura and perpendicular part of the humeri; sternopleurals 2:1. Scutellum brownish red, brownish yellow pollinose, with two pairs of strong marginals and two or three weaker pairs in addition to the decussate apicals above the apicals a pair of slightly weaker, slightly diverging bristles and one or two additional pairs of horizontal ones.

Legs black; tibiae castaneous; anterior femora grey pollinose behind.

Wings lightly cinereous, somewhat yellowish basally; epaulet yellow. Squamae white, yellowish basally; halteres yellow with brown knob.

Abdomen castaneous, with a diffuse black median vitta extending almost to the apex of the third segment, broader basally, tapering behind, fourth segment with rusty brown pollen. First segment without marginals; second with one pair; third with apical row; fourth with two rows on apical half in addition to the apically directed row. Lobes of fifth sternite almost simple, with only a slight inward curve at lower apex. Posterior forceps with the lateral ridges somewhat longer than high; apex of the broad anterior arm shallowly, broadly notched. Outer forceps with the lower arm strongly swollen and not as long as the narrow upper arm.

Female. Front one-sixth wider than eye; two orbitals.

Described from 4 ♂, 8 ♀, Los Mochis, Sinaloa, Mexico, December, 1923, and February, 1924, reared from Cirphis pupae by H. T. Osborn.

Holotype and *Allotype* in the United States National Museum *Paratypes* in Hawaiian Sugar Planters' Association collection and No. 1559 in the Canadian National collection, Ottawa.

The flies were reared from pupae of Lepidoptera collected in sugar cane fields during 1923. Mr. Swezey states that *Cirphis latiuscula* was the chief species reared by Mr. Oshborn from caterpillars present in the cane fields, while *C. cholica* (and perhaps other species) was also reared to some extent.

Archytas piliventris Van der Wulp

7 ♂ and 4 ♀ were reared from cutworm pupae collected in alfalfa fields at Los Mochis. All of these except two are probably from *Laphygma frugiperda* while two are from *Agrotis ypsilon?*

Notes on the Mexican Tachinid, Archytas Cirphis Curran, Introduced into Hawaii as an Armyworm Parasite. (Diptera)

By O. H. SWEZEY

(Presented at the meeting of December 2, 1926)

This tachinid fly was introduced from Mexico in 1924. Mr. H. T. Osborn found it parasitizing *Cirphis latiuscula* (Herr.-Sch.) in sugar cane fields at Los Mochis, Sinaloa, Mexico. A batch of parasitized chrysalids was received from Mr. Osborn February 12, 1924, from which fifteen flies issued February 12 to 26. Nine of the flies were liberated February 25 at the Federal Agricultural Experiment Station where there were armyworms in an area of nut grass. No attempt was made at rearing them in insectary.

The first intimation that this Tachinid had become established was on February 20, 1925, when Mr. Williams observed one or two in the Experiment Station grounds not far from the original liberation. Thereafter a lookout was kept for them whenever opportunities occurred, and recoveries were made as follows, showing wide distribution on Oahu and first appearance on the other islands:

Dates and Places of Recovery

1925

February 20.	Federal Experiment Station, Honolulu. (Williams)
" 23.	Manoa Cliffs Trail on Mt. Tantalus, about 1,500 ft. (Swezey)
March 10.	Experiment Station, H. S. P. A., inside on window. (Williams)
" 28.	Thurston Ave., Honolulu, numerous on milkweed. (Rosa)
April 21.	Federal Experiment Station, very numerous on corn. (Rosa)
May 15.	Ewa Plantation, Field 9, 3 flies on weeds. (Swezey)

June 11.	2048 Lanihuli Drive, Manoa, 1 fly in garden (Swezey)
June 21.	Mt. Tantalus, Twin Peaks, 2 flies on Hilo grass. (Swezey)
" 29.	Tree nursery in Makiki Valley, 2 flies on Alternanthera. (Hadden)
July 4.	Mt. Tantalus, near Mrs. Swanzy's, 2 flies on grass. (Swezey)
" 12.	Waimanalo, Olomana Needle, near summit, 1 fly (Swezey)
" 19.	Opaeula about 1,500 ft., in forest, several flies (Swezey)
August 16.	Mt. Kaala, mauka of target range. (Williams)
October 3.	Oahu Sugar Co., field 14 B. (Swezey)
" 9.	Waialua Agricultural Co., field Mill 9. (Williams)
" 12.	" " " " Gay 3. (Swezey)
" 11.	Sacred Valley, windward Oahu. (Hadden)
" 26.	Waialae Ranch. (Swezey)

1926

March 4.	Maui, Hawaiian Commercial & Sugar Co., field E, numerous. (Muir)
" 5.	Maui, Wailuku Sugar Co., near field 97, numerous. (Van Zwaluwenburg)
" 5.	Maui, near Sanatarium in Kula. (Muir)
" 16.	Wailupe, Hind-Clarke Dairy. (Hadden, Swezey)
" 30.	Kualapuu, Molokai, at G. P. Cooke's residence. (Wilder)
May 9.	Hilo, Hawaii, Hilo Hotel garden and at cemetery, (Swezey)
June	Molokai, in pineapple fields. (Illingworth)

1927

February 9.	Kauai, Lihue Hotel grounds. (Williams)
" 9.	" Lihue Plantation, field L 4. (Williams)
" 10.	" Kilauea Plantation, field 15. (Williams)
" 13.	" Summit Camp on Electric Power Line trail. (Williams)
April 3.	Palehua, south end of Waianae Mts. (Swezey)
" 10.	Kolekole Pass, Waianae Mts. (Swezey)

Distribution to Other Islands

In April, 1925, when the flies appeared numerous on corn (attracted to honey-dew from aphis and leafhoppers) at the Federal Experiment Station, an attempt was made to distribute them to the other islands. A colony of 40 flies was captured and sent in a large carton by mail to Olaa Sugar Co., April 21. None of them survived the trip. No further attempts were made till July, when Mr. Van Zwaluwenburg, who was making an inspection trip to Kauai, took along 21 that had been captured. Ten of them survived the trip. These were liberated in the garden at the Lihue Hotel. Apparently these were sufficient to give them a start, for they were found in several widely separated places by Mr. Williams in February, 1926.

On September 8, 1925, and March 16, 1926, colonies were collected and sent by Mr. L. W. Bryan when he was returning to Hilo. Of these, six and eleven, respectively, survived and were liberated, and served to effect the establishment of the parasite on Hawaii. A few flies were recovered by the writer, May 9, 1926, on flowers in the Hilo Hotel garden and at the Hilo Cemetery. As yet the fly has not been recovered at any other locality on the island of Hawaii, but no doubt it is quite widely spread by this time.

No effort was made to distribute this fly to Molokai or Maui, but it reached these islands somehow, as shown by the dates of recovery above in March, 1926.

Life History Notes

No attempts had been made at rearing this fly, and its larvipositing habit was not known till on September 3, 1926, when a fly was observed to deposit a tiny maggot on leaf of Bermuda grass on a ditch bank in field Mill 9 of Waialua Agricultural Co. The leaf with this maggot was collected, and at 8 A. M the next day it was transferred to a half-grown caterpillar of *Spodoptera mauritia*, the nut grass armyworm. The transference was made by placing the piece of grass leaf in contact with the caterpillar. As soon as the maggot came in contact with the surface of the caterpillar it became active and soon shifted to the surface of the caterpillar. It almost immediately located transversely in the segmental wrinkle anterior to the first

abdominal proleg, on the left side. It remained in this position until about 4 hours later when it was found to have penetrated half way into the caterpillar. When next observed two hours later it had entirely disappeared and there was a black dot at place of entrance. Five days later the caterpillar pupated, and later on it showed a black spot on base of right wing sheath, where it was presumed that the parasite maggot was located. However, at the end of 12 days a crippled moth issued, showing that the parasite larva failed to develop.

In September, 1926, several flies were captured in the field, and confined in a cage with growing grass, but without any caterpillars. After a few days, on examination, quite a number of the tiny maggots were found on the grass leaves. In most cases they were near the margin of the leaf and parallel to it. A number of attempts were made at rearing these maggots through to adult flies, but only a few were successful. Out of 55 of the maggots that were transferred to caterpillars of *Spodoptera mauritia,* only 4 developed to adult flies. This was sufficient, however, to indicate the length of life cycle.

In one instance, 19 of the maggots were transferred to caterpillars, one to each, on September 29. On October 5 to 6 the caterpillars were pupating. On October 17, some moths were found to have issued and died. Three chrysalids were found to contain puparia of *Archytas*, one in each. From these the adult flies issued October 26-28, making 28-30 days from the time of transference of maggot to caterpillar. In another instance it was 31 days to the emergence of the fly from the puparium.

It is known that the fly produces a large number of maggots, but it must be that a very high percentage of them perish because of the small chance of a host caterpillar coming within reach. Yet, on the island of Oahu, *Archytas cirphis* has been able to keep up its existence, even though host caterpillars are apparently scarce, as there has not been any outbreak of these caterpillars since when the first liberation of the flies occurred. It has not been determined how long the flies can live. Apparently there could be a new brood each month throughout the year, though the life cycle would no doubt be lengthened in the cooler part of the year, the same as is known with others of our insects.

Thus another armyworm enemy is permanently established and widely spread in the Hawaiian Islands and a valuable addition to the following list of introduced parasites on armyworms in Hawaii:

Tachinidae

Frontina archippivora Will., from America.

Chaetogaedia monticola (Bigot), from America.

Archytas cirphis Curran, from Mexico.

Ichneumonoidea

Amblyteles purpuripennis (Cress.), from America.

Amblyteles koebelei (Swezey), from America.

Hyposoter exiguae (Viereck), from America.

Proctotrupid egg-parasite, *Telenomus nawai* Ashm., from Japan.

Chalcid-fly, *Euplectrus platyhypenae* How., from Mexico.

PRESIDENTIAL ADDRESS

By H. F. Willard

(Presented at the meeting of December 2, 1926)

Delivering an address at the last meeting of the year is one of the pleasant and important duties required of its President by the Constitution of the Hawaiian Entomological Society. The meeting today represents the close of the twenty-second year of the existence of our society. In reviewing the addresses of the presidents during the past twenty-one years, I notice that all of them, excepting two, deal with strictly entomological subjects. It is important that a presidential address have a topic which will be of interest to the organization before which it is given. Past addresses have been of this nature, and, as a rule, have presented valuable and new observations in various branches of entomology. They have been given by men who were doing strictly entomological work, from which it was comparatively simple to select an appropriate subject. This address has been prepared by one who is able to devote only part of his time to such work, and consequently some difficulty was experienced in selecting a subject bearing on Hawaiian entomology, and which would be of interest to the Society. The following topic was finally chosen.

Some Observations in Hawaii on the Ecology of the Mediterranean Fruit Fly Ceratitis capitata Wiedemann and Its Parasites

The study of insect Ecology as a definite branch of entomology is comparatively new. Many ecological observations have been made in connection with entomological work since insects were first studied, but few of them have been published as such. Some investigators believe that study of environment is the most important phase of working out methods of control for injurious insects. One worker, Mr. Charles H. T. Town-

send, after giving much study and thought to ecology and its relation to entomology, concludes that "Environment work will be the first and last steps in the insect control of the future." (Ecology, Vol. 5, 1924). While this conclusion may be somewhat too highly comprehensive, the analysis which led to it is logical and well worked out. It is difficult to express the results of study of insect environment, unless it is divided into more or less generally recognized divisions. Mr. Townsend, in the paper above referred to, has made such divisions in an admirable manner, and for the purpose of outlining the observations now being presented, I should like to follow as nearly as possible his divisions.

He divides insect environment into three classes of elements, i. e. media, factors, and controls. Media include air, water, soil, and certain secondary and tertiary media. Factors are heat, sunlight, rainfall, atmospheric humidity, atmospheric pressure, wind, soil texture, soil moisture, vegetation, food supply, predators, and various parasites and diseases. Controls consist of topographic features of the locality, and climatic conditions such as day, night, seasons, and seasonal fluctuation. A mere glance at the large number of divisions in the study of insect environment as they have just been listed, is indicative of the enormous field to be covered in working out the ecological data of even one insect.

In presenting these observations on the fruit fly and its parasites in Hawaii, no attempt is made to give complete information on the effect of environment on these insects; but to bring before you various environmental effects which have been observed since they became established in Hawaii. Some of the observations were made by Dr. E. A. Back and Mr. C. E. Pemberton. A number have already been published in papers covering other subjects, and could be easily overlooked by the student of ecology. Consequently, I have endeavored to bring together the majority of these observations, both published and unpublished, for your consideration.

The history of the successful introduction and establishment of beneficial insects in Hawaii, as well as the rapid multiplication and spread of injurious insects here, is well known. Much of our success with beneficial insects has been due to the careful

selection of the insects to be introduced, but much credit must be given to favorable environmental conditions. Our Hawaiian environment is so favorable to the propagation of insects that many have come to believe that it is only necessary for an insect to arrive here alive and its establishment is assured. As a matter of fact, many introduced insects do not become established. In "The Hawaiian Planters' Record" for October, 1925, Swezey lists 247 species of beneficial insects which have been introduced into Hawaii since 1890. Of this number 153, or over 61 per cent of the total species introduced, are listed by him as failing to become established. This would indicate that the supposedly very favorable factors of Hawaiian environment are not conducive to the propagation of many insects.

The Mediterranean fruit fly *Ceratitis capitata*, which gained entry into Hawaii about 1910, found itself in an almost perfect environment, and it multiplied and spread rapidly. The effect of some of the individual factors of environment have been noted. The factor of heat is very favorable to its reproduction in littoral Hawaii. Here the temperature ranges from 56° to 85° F. and the fruit fly is able to produce 15 to 16 generations a year. In the higher elevations the temperature decreases and the period of development increases accordingly until, at an elevation of 4,500 feet, there appears to be only one generation a year. The fly has been found, however, in fruits in practically every locality where fruits are grown in Hawaii, indicating an adequate amount of heat for its development wherever the temperature is high enough to grow fruits suitable for Hawaiian conditions.

Reduction in the amount of heat through the application of cold storage has been extensively advocated as a method of killing maggots which may be within infested fruits that are intended for shipment to countries where this pest does not exist. A great number of experiments which have been made in Hawaii and elsewhere, show that the immature stages of the fruit fly have considerable resistance to low temperatures, and that this resistance may be affected by the temperatures in its natural environment. In Hawaii, it was found that a mature larva was able to survive for 45 days in cold storage where the temperature range was from 40° to 45° F. At a temperature

range of 32° to 33° F. one mature larva survived 18 days refrigeration in fruits wrapped in paper and packed in excelsior, but none were found to survive longer. In South Africa 33 out of 49 *C. capitata* larvae were found alive in peaches which had been held in cold storage for six weeks at a mean temperature of 33.972° F. These fruits were likewise wrapped in paper and packed in excelsior. The difference in resistance of the larvae to lack of heat in the two experiments, is probably due to the environment in the two countries where they and their ancestors had been living. In South Africa, where the infested fruits were collected for the experiment, the flies have been subject to both colder and warmer temperatures than those existing in Hawaii. It seems reasonable to conclude that the more changeable temperatures of South Africa have produced a race of flies which are more resistant to temperature changes than those in the coastal regions of Hawaii where very little variation in temperature occurs during the whole year. Excessive heat as well as deficient heat, proves fatal to immature stages of the fruit fly. Observations have shown that a large proportion of the larvae in fruits which are exposed to the direct rays of the sun are killed by the excessive heat.

The factors, sunlight, rainfall, atmospheric humidity, and atmospheric pressure, all probably have some effect on the development of *C. capitata*. No outstanding features have been noted, although it is evident they exert no great check on its development in Hawaii.

The factor of food was doubtless the greatest cause of the rapid increase in abundance and early spread of this pest after it reached the shores of Hawaii. The first measure of control tried after its arrival, was to decrease its food supply by attempting to destroy all host fruits as soon as they developed. It was soon discovered, however, that there were between 70 and 75 species of host fruits in Hawaii, in which the larvae of the fruit fly could develop. Some of these fruits, notably the guava, were widely distributed in locations inaccessible to man, and the attempt to modify this particular factor of its environment was abandoned. The abundance of host fruits in Hawaii throughout the year provides the fruit fly with a constant supply of food, and results in an abundance of flies at all times.

In the long list of host fruits may be found certain ones that are detrimental to the development of the fly and which help in a small way to reduce its numbers. The most important of these are certain citrus fruits which have a high resistance to infestation by the fruit fly. It has been shown by Back and Pemberton (Jour. of Agri. Research, 1914-15) that the mortality of eggs and larvae of the fruit fly in the skin and rag of most citrus fruits ranges from 89 to 99.8 per cent, when the eggs are deposited in a fresh puncture. While making the puncture, the female fly ruptures some of the oil cells in the skin of the fruit, releasing the oil which flows into the puncture and forms a medium which is fatal to a large number of the freshly deposited eggs. Most of the few larvae which do succeed in hatching find the rag so impervious that only occasionally are they able to reach the pulp and damage the fruit. Certain varieties of avocado (*Persea gratissima*) furnish a medium detrimental to eggs of the fruit fly. Of 1,291 eggs deposited in avocados, 54 per cent failed to hatch. This was probably due to the extra oily nature of the pulp in the fruits under observation. The green banana (*Musa* sp.) with an abundance of tannin laden juice in its skin is nearly always fatal to the eggs and young larvae of the fruit fly. The fruits of the satin-leaf (*Chrysophyllum oliviformae*) and the star apple (*C. cainito*) exude a milk-like viscid juice when punctured by the female fly. Before her eggs are deposited this juice often congeals and attaches the fly to the fruit where she eventually dies. It is not uncommon to see 12 to 15 dead flies securely glued to the surface of a star apple. Grapes (*Vitis* sp.) grown in Hawaii are very seldom infested. A recent examination of Emporer grapes, which were imported from California and subjected to attack by *C. capitata* in the laboratory at Honolulu, showed a very high mortality among the eggs. Observations of 2,251 eggs showed that 86 per cent failed to hatch, due doubtless to a lack of oxygen in an unfavorable medium. While the species of host fruits of the fruit fly are numerous in Hawaii. and provide an abundant food supply for its immature stages, a number provide very unfavorable media for its development, and act in a small way to decrease its numbers.

The number of predators present in Hawaii when *C. capitata* first arrived was not a sufficient or important enough factor in

its environment to noticeably check its spread or control it in any one locality. Certain wasps of the genus *Crabro* store the adult flies in their nests as food for their young. A nest of *Crabro tumidoventris* containing a number of adults has been reported; and a nest of *C. unicolor*, in which the food supply was almost exclusively *C. capitata*, has been observed. The small brown carnivorous ant *Pheidole megacephala* (Fabricius) preys upon the larvae in fallen fruits and when they leave the fruits to pupate. Experiments have shown that the number destroyed by this ant is important in reducing the abundance of the fruit fly about Honolulu. In some species of fruits they have been observed to destroy five-sixths of all the larvae developing. While the destruction in some other species of fruits where the larvae are less accessible would be less, the check by this ant on the development of the fly is important.

The factor of parasites, which was introduced into the Hawaiian environment of the fruit fly by man, has been of the most economic value; and illustrates one method of combating an insect by producing an unfavorable environment by the introduction of a factor from abroad which is detrimental to its development. Four species of parasites, *Opius humilis* Silvestri, *Diachasma tryoni* Cameron, *D. fullawayi* Silvestri, and *Tetrastichus giffardianus* Silvestri, were brought to Hawaii by the Territorial Government in 1913 and 1914, and have been of much value in checking the ravages of this pest. During the past eleven years they have destroyed each year from 33.2 to 56.4 per cent of all of the larvae developing in fruits about Honolulu. While this amount of parasitism has not reduced the fly sufficiently to eliminate infested fruits, most fruits of commercial importance can be harvested without infestation provided they are removed from the trees as soon as they have reached a sufficient stage of ripeness.

Some observations have been made on the effect of various phases of environment on the development of the four species of parasites already mentioned. Here we have an example of insects which pass part of their lives in three classes of media. The egg and part of the larva stage is passed in a tertiary medium, composed of the fruit fly larva which is within the host fruit, a secondary medium. When the host maggot leaves the

host fruit to pupate it often becomes a secondary medium within which the parasite passes the remainder of its larva and all of its pupa stage. The adult stage is passed within the air, a primary medium. The effect of these media upon the development of these parasites will be discussed later.

The medium within which the host maggot lives has an important effect upon the ability of parasites to attack it, and exerts a great influence upon the amount of control accomplished by them. The Opiine parasites, *O. humilis*, *D. tryoni* and *D. fullawayi* deposit their eggs within the host maggots by inserting their ovipositors through the skin of the fruit and into any host larvae within reach. It can easily be seen that fruits with thick pulp offer an opportunity for the host maggots to tunnel so far from the surface that a large percentage of them cannot be reached by the parasite's ovipositor, resulting in a low amount of parasitism. Larvae in fruits such as coffee cherries, which have very thin pulp and large seeds, are subject to parasitism readily and the percentage killed is large. For example, the parasitism by these three parasites over a period of one year of maggots in orange, *Citrus aurantium*, was 6.5 per cent; guava, *Psidium guajava*, 15.1 per cent; and mango, *Mangifera indica*, 22.9 per cent, all of which are fleshy fruits with deep pulp. Parasitism of maggots over a similar period in Indian almond *Terminalia catappa*, a fruit with a large seed and fairly thin pulp, was 49.1 per cent. The parasitism in coffee cherries has always been well over 90 per cent, and has nearly eliminated maggots in coffee cherries in the Kona coffee fields.

Records of the average number of larvae per thousand cherries from these fields have been secured for purposes of comparison, by holding the cherries over sand and recording the larvae emerging. This method of handling causes early fermentation of the coffee cherries which results in the death of some larvae before they emerge, and a record of the total number of larvae is not secured. However, the comparison of records over a series of years from collections of fruit all handled alike, gives a good indication of an increase or decrease in infestation. The number of maggots secured in this manner was 765 per thousand cherries in 1917, 42 per thousand in 1923, 33 per thousand in 1924, and 19 per thousand in 1926. A comparison of

these figures shows a decrease of over 97 per cent in infestation of coffee by *C. capitata* in the Kona coffee fields; and gives an idea of the ability of the three parasites under consideration to destroy larvae of the fruit fly which are developing in a medium where they are highly subject to parasitism.

The medium in which the parasite larva lives has a great influence on its form and rate of development. In the case of the three opiine parasites already mentioned, the newly hatched larva finds itself in the medium of the host larva. It is equipped with a heavily chitinized head bearing a pair of strong and sharp sickle-like mandibles. This highly organized head structure is evidently provided for the purpose of enabling the parasite to separate its food, which consists solely of fatty tissue, from the internal structures of its host; and to protect itself from other parasite larvae within the same host maggot. As long as the host is in the larva stage it is subject to parasitism by any one of the opiine parasites, and superparasitism has often been noted. The food supply in one host larva is sufficient for the development of only one parasite, and in the case of superparasitism a battle is waged until only one living parasite is left. A number of fruit fly larvae have been dissected, each of which revealed one living parasite larva as the sole survivor of 8 to 10.

When the host larva leaves the fruit and forms the puparium, the medium surrounding the parasite has changed greatly and has an almost immediate influence upon it. The danger of superparasitism is past, histolysis occurs changing the food supply from a semi-solid to a liquid. The parasite no longer needs a strong head structure and sharp mandibles for fighting and laceration of food and casts them off with the first molt. The resulting second instar larva has a soft and inconspicuous head and mandibles, a sluggish body, and is well equipped for life in its new medium. In this connection it is of interest to note that the first stage parasite larva never molts until the host attempts to pupate. This has resulted in wide variations in the length of the first instar. When eggs were deposited in host larvae about to pupate, the shortest duration of the first instar was 1½ days; but when eggs were deposited in young larvae, sev-

eral instances were observed where the first instar covered a period of 8 days.

The effects of the host media upon the development of the tracheal system of the opiine parasites are of interest. The first instar, living in the semi-solid medium of the host larva, has a well defined but simple treacheal system. Although no spiracles are present, the tracheae soon fill with air, probably by osmosis from the surrounding media. The second and third instars are passed in the liquid medium within the puparium of the host. Tracheae are evidently useless in a liquid medium containing little or no air, and no tracheal system can be found in either of these instars. When the larva molts into the fourth instar, or the mature stage, very little of the liquid medium of the host remains, and it finds itself with an air space surrounding it. To adapt itself to this new medium, a well defined tracheal system is present which connects with nine large, open stigmata on each side of the body. The development of the tracheal system in the various stages of the parasitic larva is directly related to the amount of air in the media surrounding them.

The question is often asked as to what the fruit fly parasites will attack should they kill all the fruit flies. Entomologists know that parasites have their natural hosts to which they are usually confined. Comparatively little is known, however, about the cause for the inability of a parasite of a particular insect to reproduce itself in all insects which belong to the same group as the host. This is probably almost entirely due to environmental conditions. It has been found that the opiine parasites of *C. capitata* in Hawaii cannot develop in the melon fly *Bactrocera cucurbitae*, a species with closely related habits. Oviposition in melon fly larvae was readily secured in the laboratory, but no parasites developed. Dissection of the parasitized larvae showed that the body fluid was an unfavorable medium for the eggs, and that they became encysted in a mass of transparent cellular material and killed. It was found also that the eggs of *Tetrastichus giffardianus* were encysted in a similar manner, and it was thought that this chalcid could not develop in *B. cucurbitae*. It was discovered later, however, that when the melon fly larvae had been attacked by the melon fly parasite *Opius fletcheri* Silvestri and subsequently parasitized

by *T. giffardianus,* some of the latter always developed. Parasitization by *O. fletcheri* seemed to eliminate the ability of the melon fly to encyst the eggs of *T. giffardianus.* Since *T. giffardianus* deposits from 8 to 30 or 40 eggs in a single host larva, which hatch into larvae that develop rapidly, the larva of *O. fletcheri* was killed, probably by starvation, in every instance but one. No instance was observed where one of the opiine fruit fly parasites was able to develop in the melon fly even though the host had been previously parasitized by *O. fletcheri.*

On the other hand, *O. fletcheri* can be readily reared from *C. capitata* in the laboratory, with no apparent detrimental effects on its development. In the field, *O. fletcheri* very seldom parasitizes larvae of the fruit fly. Records of fruit fly parasitism over a period of over 10 years, during which time hundreds of thousands of parasites have been reared from larvae parasitized in the field, less than 50 *O. fletcheri* have been secured. Although *O. fletcheri* can be easily induced to attack the fruit fly in the confinement of the laboratory, the fact that it seldom breeds in *C. capitata* under natural conditions, strongly indicates that some factor of the environment of the fruit fly is not attractive, and possibly repulsive to it.

Since there are no secondary parasites affecting the development of the parasites under consideration, the factor of parasitism is not important as a phase of their environment. *Diachasma tryoni* and *D. fullawayi* are not parasitic on each other or on *Opius humilis,* but are very detrimental to the development of *O. humilis.* As previously referred to when super-parasitism by the parasites just mentioned occurs, all but one parasite within each host larva are killed. When *O. humilis* occurs within the same larva with either of the two species of *Diachasma,* it is invariably killed. The presence of these two parasites creates an unfavorable factor in the environment of *O. humilis* and decreases its efficiency enormously. In 1915 it parasitized 31.5 per cent of all the larvae developing in fruits about Honolulu; but the influence of *D. tryoni* and *D. fullawayi* upon it, gradually decreased its effectiveness until in 1923 it parasitized only 4.1 per cent. It increased in effectiveness in 1924 and 1925, when it parasitized 14.5 per cent each year.

In coffee cherries in Kona, this influence has been even more marked. In this fruit the total parasitism has always been high and superparasitism must have been correspondingly high. The first records of parasitism of *C. capitata* in Kona coffee, secured in the early part of 1915, show that *O. humilis* parasitized from 59 to 97 per cent of all the larvae developing. The two species of *Diachasma* became abundant soon after, and the effectiveness of *O. humilis* rapidly diminished. The fruit fly larvae from 18,955 coffee cherries collected in Kona in 1926 did not produce a single *O. humilis*. In this instance by introducing parasites as a factor to create an unfavorable environment for the development of the Mediterranean fruit fly, a factor so unfavorable to the development of one of the most valuable parasites was introduced so that the effectiveness of that parasite is very small.

Insect ecology is rapidly approaching a place of first importance in the work of the economic entomologist. With a knowledge of the ecological factors affecting the development of insects, he is often able to create an unfavorable environment to replace a favorable one in his fight against injurious insects, and in the case of beneficial insects, assist them by the introduction of favorable ecological factors. In presenting these observations on the ecology of *C. capitata* and its parasites in Hawaii, no attempt has been made to give complete ecological data. The more important effects of environment upon the development of these insects since their introduction into Hawaii have been brought together, however, and it is hoped they will add something to the importance of insect ecology in the work of the applied entomologist.

New Species of Hawaiian Chalcid-Flies (Hymenoptera)—II

BY P. H. TIMBERLAKE

Citrus Experiment Station, Riverside, California

(Presented by title by O. H. Swezey at the meeting of Dec. 2, 1926)

The types of the new species described in this paper have been deposited in the collection of the Hawaiian Entomological Society, and paratypes in the United States National Museum.

ENCYRTIDAE

Coccidencyrtus Ashmead.

Coccidencyrtus was poorly and in some respects incorrectly described by Ashmead, but has been quite correctly identified by Mercet. The pedicel is not short as stated by Ashmead, since in the type species *C. ensifer* (Howard) it is twice as long as wide and as long as the first two funicle joints combined. The mandibles in *ensifer* have an acute, rather large, outer tooth and a moderately broad inner truncation which is slightly retuse thus faintly indicating a middle and inner tooth, and are armed on outer edge near the middle with a rather long slender spine.

The species *C. flavus* Ashmead from South Africa (Can. Ent., 33, p. 139, 1901) belongs to the genus *Metaphycus* Mercet and probably to the subgeneric group *Euaphycus* Mercet. As it is congeneric with *Metaphycus flavus* (Howard) it requires a new name, hence it may be designated in the future as *Metaphycus subflavus* Timb.

Coccidencyrtus ochraceipes Gahan.* Figure 1.

Easily distinguished from all described species of the genus by having the legs and antennae almost uniformly pale yellow and by the large yellow spot at the base of the abdomen.

Female

Head somewhat broader than thorax, distinctly wider than long, broadest just above the middle, the cheeks converging arcuately to the broad

* While in press, the discovery was made by Mr Timberlake that the species here described by him under another name had recently been described by Mr. Gahan in Proc. U. S. Nat. Mus., 71, Art. 4, p. 18, 1927. [Ed.]

oral margin, the dorsal margin as seen in frontal view gently rounded, and the thickness fronto-occipitally about two-thirds of the length. Face rather abruptly inflexed but the frons not prominent, eyes rather small, the cheeks moderately long. Frontovertex about as long as wide and covering about one-half of the dorsal surface of head. Ocelli minute, arranged in an approximately equilateral triangle, the posterior pair very close to the acute occipital margin and about twice their own diameter from the margin of eyes, and the anterior ocellus placed a little behind the center of frontovertex. Face rather plane, with the antennal scrobes moderately deep and broad, converging above and uniting just below angle between face and frons, and separated otherwise by the longitudinal facial prominence in the form of a convex ridge, hardly widened below and gradually tapering in height and width above. Antennal sockets placed moderately far apart on ocular line and not much more than their own length from oral margin. Scape slenderly fusiform, not very long; pedicel about twice as long as wide at apex, and slightly longer than first two funicle joints combined; funicle increasing very slightly in width distad and the joints successively increasing in size, except that the first three are nearly equal and as long as wide, the sixth joint a little longer than wide; club elongate-oval, rather pointed at apex, not quite twice as wide and about as long as funicle, and its three joints subequal in length. Mandibles narrower at apex than in *C. ensifer* (Howard), the outer tooth much shorter and separated by a comparatively shallow obtuse emargination from the inner teeth, the truncation indistinct or divided into two very short blunt teeth by a shallow emargination, and the spine on outer edge somewhat shorter and inserted a little nearer the base. Maxillary palpi three-jointed, rather stout, the first joint about twice as long as thick at apex, the second somewhat shorter and considerably broader than the first and about as wide as long, the apical joint about as long as the two preceding joints combined, cylindrical, not so thick as second joint and obliquely truncate at apex. Labial palpi slender, two-jointed, the second joint finer and somewhat shorter than the first.

Thorax depressed, or only very slightly convex above, and about one-half longer than wide. Pronotum very short, mainly concealed by the head, the hind margin broadly and gently arcuate. Mesoscutum transverse, not quite twice as wide as long, the hind margin straight except for a slight angular projection medially between tips of axillae. Axillae rather more than twice as broad as long and separated medially by a space about equal to their length at outer ends. Scutellum slightly shorter than mesoscutum, as long as wide at base and well rounded at apex, the margins perpendicularly declivous but only slightly elevated above surrounding parts, and the disk strongly depressed. Propodeum extremely short medially and moderately long at sides. Abdomen as wide as thorax and considerably shorter, widest about at the basal third and thence arcuately narrowing to the rather acute apex; tergum strongly depressed; ovipositor sheaths slightly protruded at apex, the spicula showing no tendency to become disengaged as in *C. ensifer;* cercal plates situated on lateral margins just posterior to the widest part of disk.

Legs ordinary in structure and length, the spur of middle tibiae about as long as the middle basitarsus. Wings of ordinary proportions; disk very finely and rather densely setose, the speculum obscure and less evident than a hairless streak bordering the inner margin of apical part of

venation; setae on basal area paler in color and considerably sparser than those on rest of disk but quite uniformly distributed. Marginal fringe short and rather dense. Venation terminating considerably before the middle of costal margin; submarginal vein slightly thickened in its apical third; marginal vein about as long as wide; postmarginal and stigmal veins about equal, hardly twice as long as marginal and meeting in a very acute angle; stigmal vein triangularly enlarged almost from the base to apex, its apical margin with a row of about five circular pores. Submarginal vein armed with about eight fine, rather short bristles, which become a little longer and coarser on the thickened part of the vein; marginal and postmarginal veins together with about ten setae, of which about one-half are placed on the costal margin and are slightly coarser than other setae of costal margin nearby.

Face with fine reticulations, the bottom of the scrobes smoother and more shining; frontovertex and mesoscutum shining and with very fine reticulations, which are uniformly hexagonal on mesoscutum and more irregular and somewhat transversely lengthened on frontovertex; axillae sculptured like the scutum, but the scutellum opaque and very densely and minutely granular; mesopleura very delicately lineolate and practically smooth; abdomen shining and very obscurely and delicately, transversely reticulated. Pubescence sparse, very fine, dark colored and inconspicuous; short and erect on frontovertex, extremely short on eyes, reclinate and rather distinctly arranged in four longitudinal rows on mesoscutum, and restricted to about three pairs of setae on scutellum, of which the apical pair is twice as long as the others and erect. Abdomen with a very few fine hairs on apical margin and a few shorter hairs on ovipositor sheaths.

Head and thorax nearly black, with a strong, tolerably brilliant reddish purple and brassy green luster on frontovertex, mesoscutum and axillae; face and pleura shining but hardly metallic, the scutellum matt. Abdomen with a large pale yellow basal macula, reaching rather more than half way to apex, and even larger on ventral surface; the margins broadly piceous with a slight greenish luster above toward base. Antennae pale yellow, with the club slightly dusky. Legs, including coxae, pale yellow or almost whitish toward base. Wings hyaline, the setae dusky, the venation at apex fuscous but most of submarginal vein somewhat yellowish.

Length of body (0.549 to) 0.636; length of head, 0.232; width of head, 0.280; width of frontovertex, 0.134; length of antenna, 0.428; width of mesoscutum, 0.259; length of fore wing, 0.697; width of fore wing, 0.307; length of protruded part of ovipositor, 0.047 mm.

Described from twelve females reared at Honolulu, Oahu, during March and on April 1, 1926, (Fullaway), and one female reared at Berkeley, California, March 11, 1912 (Roy Campbell), all from *Diaspis boisduvalii* Sign.

EULOPHIDAE.

Elachertus giffardi n. sp. Figures 3-4.

Similar to *E. advena* Timb. but distinguished by having the scutellum delicately tessellate and shining, with the grooved lines impunctate, and in the male by having the antennae much more ordinary in structure.

Female

Head a little wider than long, rather thick fronto-occipitally, well rounded above, the cheeks strongly converging toward the mouth. Occiput moderately concave, the dorsal margin strongly angled and slightly carinate. Frontovertex covering a little more than half the dorsal surface of head. Ocelli in an obtuse angle, the posterior pair situated rather less than their own diameter from occipital margin and twice as far from the eye margin. Eyes rather large, broadly ovate, about one-third longer than wide, the inner orbits parallel. Cheeks short, with a very fine but distinct genal suture. Face deeply grooved to form the scrobal impression, which broadly and shallowly emarginates the anterior margin of frons. Antennal sockets situated on the ocular line and about twice their own diameter apart, the distance between them not much less than distance from either to nearest point of oral margin. Scape slenderly fusiform, as long as the next four joints combined and a little wider than pedicel; pedicel twice as long as thick at apex and equal in length to first funicle joint; ring joint small but distinct; first funicle joint twice as long as wide and longer than any of the following joints, the second a little longer than wide, the third and fourth joints approximately as long as wide, or the fourth slightly wider than long; club two-jointed, slightly longer than last two funicle joints combined and a little wider than the funicle, the apical joint short and acute; setae on antennae fine, short and sparse.

Thorax about twice as long as wide and moderately convex Middle lobe of mesoscutum about as long as wide at its anterior end, and not quite so wide at its posterior end as base of disk of scutellum between the grooves. Axillae well separated, reaching barely further inward than ends of parapsidal lines. Scutellum somewhat longer than mesoscutum, the disk between the grooved lines nearly twice as long as wide at base, the marginal grooves almost straight but diverging toward apex, where they curve inward but do not quite meet medially. Propodeum about as long as mesoscutum and produced into a short neck at apex. Abdomen depressed, narrowly ovate, and including the slightly exserted ovipositor sheaths slightly more than twice as long as wide and nearly as long as thorax. Spicula of ovipositor with a strong tendency to become disengaged from sheaths, almost as long as abdomen, and cylindrical in shape, with a narrow blade-like expansion on apical third but contracted to a very slender point at apex. Wings and legs approximately as in *E. advena*.

Head moderately dull, subrugulosely reticulate and with fine shallow rather close punctures, bottom of scrobal impression smooth. Mesoscutum sculptured much like the head but with coarser reticulations and without distinct punctures. Axillae and disk of scutellum shining and delicately tessellate, the tessellation of axillae very indistinct; grooved lines of scutellum not punctured. Metanotum and disk of propodeum polished, the latter with a median carina that is provided with short oblique branches. Pleura mainly polished, the abdomen smooth. Pubescence much as in *E. advena*, but by far less conspicuous since it is not whitish as in that species, and it is apparently somewhat shorter and sparser on the thorax but with the same arrangement of longer bristles as in the other species.

Head and thorax dark aeneous green, the metallic luster rather dull, mostly brassy but with dark reddish and purple tints on scutellum. Mandibles brown. Antennae dull yellow, the scape and pedicel clearer yellow, the flagellum tinged with brown, which becomes more pronounced toward apex. Abdomen with a slight metallic luster, shining brown on disk but broadly piceous at margins and apex. Legs dull yellow with a slight brownish tint, the front coxae brown. Wings hyaline, very faintly tinted with fuscous, the veins yellowish.

Length of body, 1.57; length of head, 0.405; width of head, 0.465; width of vertex at anterior ocellus, 0.261; length of antennae, 0.657; width of mesoscutum, 0.409; length of fore wing, 1.101; width of fore wing, 0.486 mm.

Male

Very similar to the female, with the head a little thinner fronto-occipitally and the abdomen considerably smaller than thorax and with parallel sides. Antennae eight-jointed; the scape shorter and a little stouter than in female and as long as next three joints combined, pedicel about one-half longer than wide; flagellum six-jointed, without a ring joint, the first joint largest and longest, the others gradually decreasing slightly in size distad, the sixth joint conical and pointed at apex, the first four constricted at articulation with the following joint by an excavation on dorsal side.

Coloration much as in the female, but with the mesoscutum considerably more brilliantly metallic, brassy on parapsides and dark purple on the middle lobe of mesoscutum; flagellum uniformly pale dull yellowish brown, abdomen much as in the female with the apical half dark and the basal half brown and with a small central yellowish spot on disk betwen the two other colors.

Length of body, 1.27; length of head, 0.348; width of head, 0.408; width of vertex at anterior ocellus, 0.239; length of antennae, 0.726; width of mesoscutum, 0.354; length of fore wing, 1 019; width of fore wing, 0.456 mm.

Described from four females and one male (holotype female, allotype and paratypes) reared January 14, 1907, from an unknown host collected on December 9, 1906, in Moanalua Valley, Oahu, at 500 feet elevation, by W. M. Giffard (Giffard's No. 415 B).

In my list of introduced and immigrant chalcid-flies of the Hawaiian Islands, the date given for this species (No. 117) was cited incorrectly through a clerical error.

Notanisomorphomyia Girault.

As used here *Notanisomorphomyia* includes those *Sympiesis*-like species which have the abdomen moderately long at the most, the propodeum smooth and carinate, and the male with ramose antennae.

Notanisomorphomyia externa n. sp. Figure 2.

This species is similar to the North American species (*Sympiesis*) *N. felti* (Crawford), (*Sympiesis*) *N. agromyzae* (Gahan) and (*Eulophus*) *N. guttiventris* (Girault). From *N. felti* it differs by having the transverse carina of propodeum intersecting the median carina at or very near the middle of the propodeum, the outer lobes of mesoscutum sculptured throughout like the middle lobe, the head shining, slightly bluish black with a weak metallic luster, etc. From *N. agromyzae* it differs by having a strong reticulate sculpture on mesoscutum, the axillae delicately lineolate-reticulate, the abdomen distinctly shorter than thorax, etc. From *N. guttiventris* it differs by having a large yellowish brown mark on abdomen, the venter entirely of this color except the rather narrow lateral and apical margins, the first segment of the gaster much the longest, the first funicle joint not twice as long as the third, the scape longer than pedicel, ring joint and first funicle joint combined, etc.

Female

Head of the usual Eulophine shape, much broader than long, with the cheeks as seen from in front strongly converging to the moderately wide oral margin, the sides above strongly rounded, the dorsal margin gently rounded; as seen from the side the head appears lenticular, with the occipital surface a little less convex than anterior surface; as seen from above the head appears transverse, slightly emarginate medially in front and broadly emarginate behind. Eyes not very large, convexly protuberant, the inner orbits just perceptibly convergent below. Vertex transverse and somewhat more than one-half as wide as whole head Ocelli rather large, arranged in a very obtuse-angled triangle, the posterior pair a little closer to the eye margins than their distance apart Face with a rather shallow scrobal impression above antennae, the apex of the impression reaching nearly to anterior ocellus, the sloping sides not nearly reaching to margins of eyes, the bottom of impression with a triangular depressed area, very acute above. Antennal sockets small, nearly circular, placed hardly more than their own diameter apart and considerably above ocular line, and a little below middle of face in frontal view of head. Cheeks short, not quite one-half the width of eyes, the genal suture distinct.

Antennae nine-jointed; scape linear, compressed, hardly wider than pedicel and as long as pedicel, ring joint, first and about one-half of second funicle joint combined and reaching distinctly beyond level of vertex; pedicel about one-half longer than thick and somewhat more than one-third as long as first funicle joint; ring joint small and transverse; flagellum compressed, the first funicle joint about thrice as long as wide, the next three joints gradually shortening, the fourth funicle joint wider than preceding joints and not quite twice as long as wide; club distinctly longer than preceding joint and about equal to the third funicle joint, the terminal joint excluding nipple about two-thirds as long as the basal joint, the nipple moderately short and not articulated. Dorsal margin of scape with fine short setae; the flagellum with rather sparse whitish bristle-like setae, which are a little longer than width of ring joint. Mandibles with two distinct, rather acute and deeply divided

outer teeth and an inner truncation bearing three to four minute bluntly rounded teeth. Maxillary palpi two-jointed, the terminal joint rather long, slender, cylindrical and nearly twice as long as basal joint, which is considerably stouter. Labial palpi one-jointed, cylindrical, about three-fourths as long as terminal joint of maxillary palpus, not quite so thick, squarely truncate at apex and provided with two long apical setae.

Thorax about two and one-half times longer than wide, broadest at posterior margin of mesoscutum, moderately convex from side to side, and considerably arched longitudinally. Pronotum hardly shorter than mesoscutum, concial and with the collar not discrete. Lateral lobes of mesoscutum set off anteriorly by rather deep depressions and forming rather prominent, rounded shoulders, parapsidal lines on disk of mesoscutum practically obsolete. Scutellum somewhat longer than wide, well elevated and abruptly declivous at sides, its surface discontinuous with that of metanotum. Metanotum about one-sixth as long as scutellum, with an apical arcuate carina and a more or less distinct median carina. Propodeum about as long as scutellum, strongly hollowed out on each side at apex and produced medially to a short, distinct, well elevated neck, the hollow on each side of neck partially closed by a thin semi-transparent lamina; disk of propodeum provided with one transverse and three longitudinal carinae, the lateral pair diverging to transverse carina, then strongly converging arcuately and reaching to apex of the neck, of which they form the dorsal lateral boundaries; transverse carina meeting the lateral pair behind the middle, but meeting the median very near the middle of disk. Spiracles of propodeum small, circular and contiguous to anterior margin of the segment. Abdomen depressed, oval to ovate, about twice as long as wide to a more or less extent in different specimens, about as wide as thorax and hardly as long, the dorsal surface somewhat concave, the apex acute, first tergite of gaster fully as long as the next three combined; ovipositor not distinctly protruded. Legs long and slender; outer spur at apex of hind tibiae obscure and very much shorter than the inner spur. Submarginal vein of fore wings hardly shorter than marginal vein, the postmarginal about three-fourths as long as the marginal and twice as long as the stigmal vein.

Head mainly polished, the face medially below antennae with transverse lineolations, the frons on each side of scrobal impressions rather finely reticulate, and the occipital surface with transverse lineolations which anastomose in places to form reticulations. Mesoscutum and scutellum rather coarsely reticulated with raised lines. Pronotum subreticulate posteriorly and anteriorly with transverse raised lines which continue on to the pleura. Axillae with delicate lineolations. Apical margin of scutellum with a transverse sulcate line, that is provided with cross carinae at frequent and regular intervals, thus producing small puncture-like foveae. Metanotum and propodeum polished, but with a fine delicate reticulation apparent in favorable light, the sides of propodeum with fine setiferous punctures. Pleura, except propleura, for the most part, and abdomen polished. Pubescence whitish, fine and rather long, except on the head where the hairs are rather sparse, very short and mostly confined to upper part of occiput and face. Pubescence of thorax densest and most conspicuous on sides of propodeum, where the hairs are long; hairs on mesoscutum somewhat shorter, moderately numerous and mostly decumbent, but a pair on posterior margin submedially and two pairs on

scutellum longer and semierect, those on scutellum directed backward and inward, so that the tips of the posterior pair nearly meet; scutellum otherwise bare. Abdomen with a few fine short hairs mostly around the margins, but the basal tergite also provided across the disk with numerous, fine, moderately long and decumbent hairs.

Head slightly bluish black, shining but only weakly metallic, a purplish and brassy luster sometimes apparent on vertex. Thorax dark green with a moderately brilliant brassy luster, which becomes slightly reddish on scutellum. Abdomen shining piceous, with a large brownish yellow mark on basal half, both above and beneath, reaching almost to lateral margin and on venter reaching nearly to apex. On the first segment of gaster the pale mark extends quite to the base but not quite so far to the sides as on the other segments. Dark lateral margins on basal half of gaster distinctly brassy green. Petiole of abdomen also brownish yellow. Mandibles dark brown. Scape pale yellow but becoming dusky at apex, the pedicel and flagellum dull piceous. Legs, including coxae, entirely pale yellow. Wings hyaline, the veins slightly dusky yellowish, the submarginal vein clearer yellowish.

Length of body (0.97 to) 2.35, length of head, 0.465; width of head, 0.649; width of vertex at posterior ocelli, 0.374; length of antenna, 1.337; width of mesoscutum, 0.609; length of fore wing, 2.060, width of fore wing, 0.860 mm.

Small specimens (1.25 mm. or less long) show less of the characteristic sculpture and those less than 1.0 mm. long have the reticulations of mesonotum very faint.

Described from seven females (holotype and paratypes) reared May 9-11, 1924, from *Bedellia orchilella* Walsm., collected on April 29 at Waipio, Oahu (Swezey); six females (paratypes) reared April 22 to May 4, 1922 from *Gracilaria marginestrigata* Walsm., on *Xanthium*, Kaimuki, Oahu (Timberlake); fifteen females (paratypes) from the same host on *Sida*, Feb. 16 to March 3, 1924, Kaimuki, Oahu (Timberlake); five females (paratypes) from *Cremastobombycia lantanella* Busck, collected May 6, 1921, at Lihue, Kauai (Swezey); one female (paratype) collected at Malamalama, Oahu, July 28, 1918 (Timberlake); two females (paratypes) from *Gracilaria neraudicola* Sw., July 25, 1921, south of Hilo, Hawaii (Swezey); two females (paratypes) from *Philodoria pipturicola* Sw., Dec. 9, 1922, Wailuku, Maui (Swezey); 1 female (paratype) from *Cremastobombycia lantanella* Busck, May 17, 1921, Ulupalakua, Maui (Swezey); two females (paratypes) from *Gracilaria hibiscella* Sw., May 28, 1923, Honolulu, Oahu (Swezey); one female (paratype) from *Gracilaria epibathra* Walsm., Nov. 12, 1922, Lanihuli, Oahu (Swezey); one female (paratype) from *Cremastobombycia lan-*

tanella Busck, March 27, 1921, Makaha, Oahu (Swezey); one female (paratype) from the same host, June 8, 1921, Waiawa, Oahu (Swezey); and one female (paratype) from *Euhyposmocoma trivitella* Sw., May 13, 1923, Kilohana, Kauai (Swezey).

This parasite has been reared by Mr. Swezey also from the *Cremastobombycia* collected at Waiahole, Oahu, Spreckelsville, Maui and Huehue, Hawaii; from *Aristotelia* sp. in *Kadua*, April 5, 1919, Tantalus, Oahu; from *Gracilaria hauicola* Sw., Sept. 8, 1921, Wailua, Kauai; and from *Agromyza* sp. in *Cocculus*, April 10, 1921, Opaeula, Oahu.

TRICHOGRAMMATIDAE

Ittys perditrix (Gahan).

Specimens reared by the writer July 19-20, 1916, from eggs of *Nesophrosyne maritima* Kirkaldy, in *Dodonaea* leaves collected at Makua, Oahu, July 16 (Swezey), agree closely with the description of *Ittys perditrix* (Gahan). The only discrepancy is the presence of two transverse lines on abdomen, more or less broken up into dots, and not very conspicuous. *I. perditrix* was originally reared from eggs of *Stictocephala festina* (Say) at Tempe, Arizona.

Ufens elimaeae n. sp. Figures 5-6.

This species is closely allied to the North American species, *U. niger* (Ashmead), which is the type of the genus, but it differs by having the discal setae of fore wings much sparser and arranged in about twenty-three more or less even lines, the antennae considerably stouter and somewhat contorted, the abdomen shorter, stouter and with a shorter ovipositor, the legs nearly uniformly dusky yellow, etc. Among the Australian species described by Girault it is perhaps most similar to *U. flavipes* and *U. hercules*, but is distinguished by the long marginal vein, uniformly pale legs, by the longest marginal cilia of hind wing being distinctly longer than width of disk, etc.

There are two ring joints in the genus *Ufens* instead of only one, as stated by Girault, but the second joint is often very obscure on account of its close application to the base of the funicle.

Female

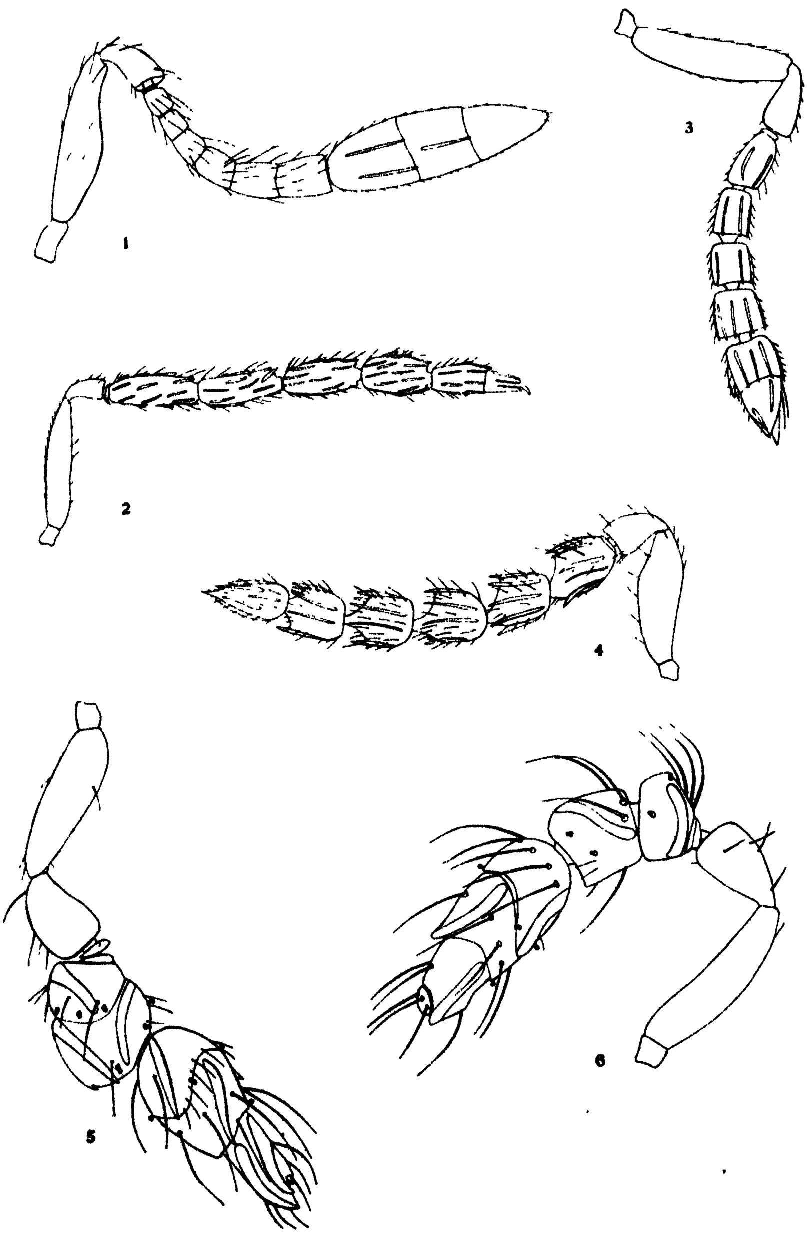
Antennae nine-jointed. Scape fusiform, somewhat shorter than pedicel and funicle combined. Pedicel broader at apex than scape and considerably less than twice as long as wide (sometimes appearing even broader than shown in figure). Ring joints very small, equal, the second one more or less imbedded in base of first funicle joint. Funicle somewhat

longer than wide, wider than the club, distinctly longer than pedicel, divided by strongly curved suture into two closely joined segments and provided with large corneous sensoria. Club inserted obliquely on ventral edge of apex of funicle, three-jointed, the two basal joints closely joined and separated by an extremely fine suture (much more curved on reverse side of that shown in figure), the apical joint much narrower and nearly as long as the other two combined, (on reverse side of that shown in figure the separating suture deeply indents the apical margin of second joint); corneous sensoria of club, especially those on apical joint, very large and conspicuous. Antenna provided with bristle-like setae, which are very sparse on scape and comparatively long and coarse on club, the basal joint of club with a transverse arcuate row of small setae close to the apical margin.

Fore wings very broad, triangular in shape with apex rounded. Marginal fringe short and moderately dense. Discal setae arranged in about twenty-three lines, two of which are more prominent than others, viz., the one starting from apex of stigmal vein and about the fifth one from posterior margin; the latter line reaching much farther basad than all the others and opposite to the apical part of submarginal vein; an oblique curved line from apex of stigmal vein toward posterior margin also prominent. Submarginal vein strongly broken, the thickened apical part beyond the break about as wide and almost as long as the marginal vein. Marginal vein approximately four times as long as wide and truncate at apex. Stigmal vein about three-fourths as long as marginal, constricted at base where it is inserted at an angle of about 45 degrees with marginal, then abruptly bent downward so that it becomes almost at a right angle with marginal; the part beyond constriction oblong, provided with a large uncus on distal margin a little beyond the middle, the posterior margin of uncus forming a right angle with the oblong part of vein and the anterior margin continuous with that of the constricted part of vein; uncus provided with four pustules which are arranged in a line and decrease in size toward apex. Costal cell at apex provided with three marginal bristle-like setae and three much smaller setae on the disk. Disk of wing below submarginal vein with a row of six setae, one or two of which are inserted on the oblique extension of the vein. Submarginal vein provided with one bristle-like seta on each surface of disk of proximal part and one on distal part near apex. Marginal vein with three coarse bristle-like setae on the margin, which are about three-fourths as long as vein itself, and with five much smaller setae on the disk and four on the reverse surface. Stigmal vein with about three

Explanation of Figures, Plate XVIII.

Fig. 1. *Coccidencyrtus ochraceipes.* Antenna of female.
Fig. 2. *Notanisomorphomyia externa.* Antenna of female.
Fig. 3. *Elachertus giffardi.* Antenna of female.
Fig. 4. *Elachertus giffardi.* Antenna of male.
Fig. 5. *Ufens climaeae.* Antenna of female.
Fig. 6. *Ufens elimaeae.* Antenna of male.



Hawaiian Chalcid-flies.

setae at apex, which form a part of the oblique curved discal line of setae, and provided with one seta on reverse surface near base of uncus. Hind wings linear, rather acute at apex, the basal part constricted and extremely narrow opposite middle of venation, the marginal fringe barely longer than greatest width of disk; the discal setae arranged in three lines.

General form of body robust, the thorax not much longer than wide. Head about as wide as thorax, the vertex very broad. Mesonotum gently convex, the scutellum about as long as wide and broadly rounded at apex. Abdomen about as long and as wide as thorax.

Body piceous or brownish piceous, appearing decidedly brownish by transmitted light in slide mounts. Head, except the more chitinized gular region, and antennae yellowish brown. Legs dusky yellow, the hind femora, and hind tibiae in less degree, more dusky but not definitely piceous. Eyes and ocelli dark red. Wings clear hyaline, the veins brown.

Length of body, 0.472 to 0.894; length of scape, 0.096; length of pedicel, 0.049; length of funicle, 0.068; length of club, 0.121; length of fore wing, 0.489; width of fore wing, 0.311; greatest length of marginal fringe of fore wing, 0.021 mm.

Male

Very similar to the female except in antennae and color of head. Antennae nine-jointed, not quite so stout as in the female, the club inserted normally at center of apex of funicle, the bristles on flagellum a little longer and much more numerous than in the female. Funicle joints more quadrate, the suture transverse. Club elongate-ovate, four-jointed, with the apical joint a minute button, which is distinctly articulated. Second ring joint very obscure in ordinary position of antennae but sometimes distinctly visible. The large sensorium on first funicle joint transverse and more or less arcuate. Head almost entirely brownish yellow, the antennae also yellower than in the female.

Length of body, 0.562 to 0.838; length of scape, 0.106; length of pedicel, 0.051; length of funicle, 0.069; length of club, 0.111; length of fore wing, 0.519; width of fore wing, 0.354; greatest length of marginal fringe of fore wing, 0.023 mm.

Described from thirty females and five males (holotype female, allotype and paratypes), reared January 31, 1916, from egg of *Elimaea punctifera* (Walker) in koa leaf, collected on Tantalus, Oahu, January 16 (Swezey); one female and one male (paratypes) from same host, Waikiki, Oahu, November 16, 1919 (Pemberton); three females (paratypes) from same host, Barber's Point, Oahu, December 23, 1923 (Swezey); and eight females and four males (paratypes) mounted on a card and reared from the same host at Honolulu, March 10, 1925 (Swezey).

This parasite has been reared also fom the eggs of *Holochlora japonica* Brunner.

Biological Control of Insect Pests in the Hawaiian Islands *

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(Presented by title by O. H. Swezey at the meeting of December 2, 1926)

One of the outstanding results of the great commercial and agricultural developments of the past century has been the enormous increase of insect pests. Some of these pests have been distributed by commerce and many of them have become great pests only after leaving their home country. We need mention only a few of these which have been carried by commerce from one land to another, until now some are practically cosmopolitan, such as the black scale, the fluted scale, certain plant lice or aphids, the house-fly, etc. Others are somewhat less widely distributed such as the Hessian fly, the codling moth, and the Mediterranean fruit fly. Still others have limited distribution in their new habitat but are exceedingly destructive there, such as the gipsy moth in New England, the alfalfa weevil in Utah, the Popillia beetle in New Jersey and the sugar-cane leafhopper in Hawaii. Another group of pests includes those that have taken advantage of the changes in ecological conditions wrought by man and have become obnoxiously abundant because of great increases in their food supplies. A good example of these species is the Colorado potato beetle. This species also has greatly increased its range by natural spread and more lately has been introduced into Europe by commerce.

This enormous increase in insect pests during the past fifty years has incited the development of economic entomology, and it has been found expedient to develop and use many different methods of control, such as by farm practices, including rotation of crops, spraying, dusting, fumigation, and by ecological or biological factors. Moreover, the prevention so far as possible

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of the further spread of injurious species has been attempted by means of inspection and quarantine work.

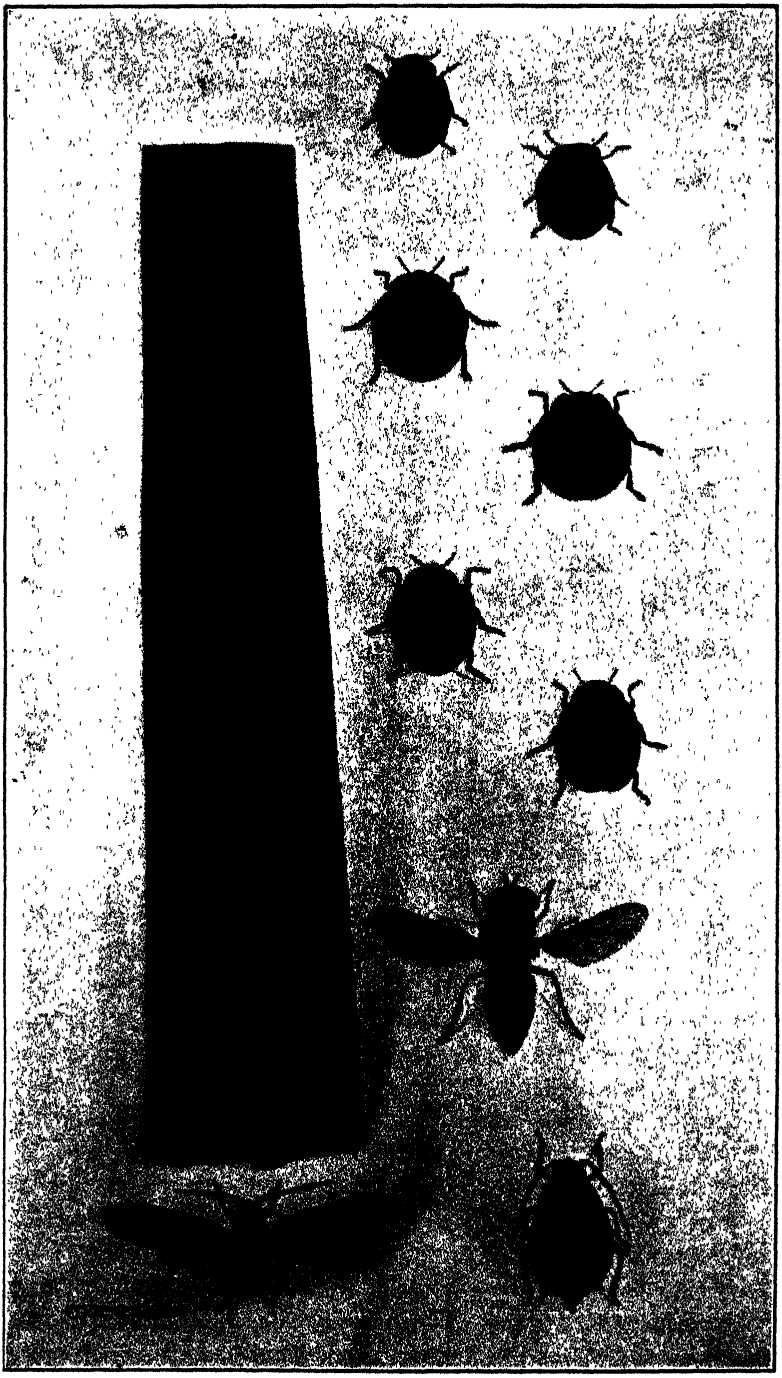
The control of insect pests by ecological factors, to wit, by natural enemies, purposely introduced into any given fauna by man is a comparatively modern method of fighting such pests and is still in its infancy. This method is capable of unlimited development and offers great possibilities, but good results are obtained only by a prodigious amount of hard and careful work, attended by many disappointing failures.

Although it probably had occurred to thoughtful men years before that insect pests might be controlled by the introduction of their enemies from one country into another the first big attempt to carry this idea out was made, I believe, in 1888, nearly 40 years ago, when Albert Koebele, working for the U. S. Department of Agriculture, discovered the Vedalia beetle in Australia and successfully introduced it into California. The result of this introduction was phenomenal; the fluted scale was brought into subjection within a remarkably short time and ever since has never been more than a minor pest in California.

Encouraged by the success of Vedalia against the fluted scale in California, certain foreign countries which were troubled with the same pest sought to establish the Vedalia within their own boundaries. Among these was Hawaii, at that time an independent monarchy and a few years later a republic. As I understand the situation existant in Hawaii at that time the fluted scale had not spread to any great extent but had made itself conspicuous on street trees near the waterfront in Honolulu The situation, however, in regard to both this and other pests was serious enough, and the services of Mr. Koebele were secured in 1893, by the Hawaiian Government. The Vedalia

EXPLANATION OF PLATE XIX.

1. *Aphis sacchari*, winged female.
2. *Aphis sacchari*, wingless female.
3. Syrphid fly, *Simosyrphus grandicornis*.
4. *Olla abdominalis*.
5. *Coelophora inaequalis*.
6. *Scymnus notescens*.
8. *Coelophora pupillata*.
7. *Platyomus lividigaster*.



Cane aphis and introduced enemies.

had already been sent over from California at that time, in fact as early as 1890, and effected a cleanup quite as efficient as in California. Even to this day the fluted scale has been held in subjection, apparently more perfectly even than in California, so that rarely any more than a few scattered scales are found by the entomologist and an extensive infestation is entirely unknown. One of Koebele's first acts on moving to Hawaii was to secure colonies of Cryptolaemus, which he had previously introduced into California from Australia. This ladybird was required at that time to help control the extensive infestations of *Pulvinaria psidii* Mask. on coffee and other plants. Other introductions from Australia probably through California were *Lindorus ventralis* (Erich.) and *Lindorus lophanthae* (Blaisd.). In 1894 to 1896 Mr. Koebele traveled extensively in Japan, China, Ceylon, Fiji, and Australia, and his introductions at that time include: *Coelophora inaequalis* (Fab.), a lady beetle from Australia, feeding on plant lice or aphids and especially needed at that time to feed on the sugar-cane aphid; *Brachymeria obscurata* (Walker), a small hymenopterous parasite of Lepidoptera and especially desired to control the destructive coconut leaf-roller; *Microbracon omiodivorus* (Terry), another hymenopterous parasite, found by Koebele with the preceding in China and introduced for the same purpose; *Scymnodes lividigaster* (Muls.), an efficient little lady beetle from Australia, feeding on plant-lice; *Coelophora pupillata* (Schön.) from China, another lady-beetle, more inclined to inhabit trees than low vegetation and much rarer in Hawaii than the ubiquitous *inaequalis; Orcus chalybaeus* (Boisd.) from Australia and *Chilocorus circumdatus* Schön. from southern China, both of these valuable ladybeetles predaceus on diaspine scales, the Orcus found principally on the foliage of trees and the Chilocorus on the trunk and branches. A considerable list of other beneficial insects was introduced at that time, including several other species of ladybeetles, some of which flourished for a time but later died out. The records of that period are very incomplete and a number of important hymenopterous parasites, especially of scale-insects, which were found established in the islands later were probably introduced by Koebele at that time. The principal accomplishment of the period, however, was the introduction of ladybeetles, which were

always favorites with Mr. Koebele following the success of Vedalia. Fourteen species of ladybeetles now more or less common in the Islands and possibly one or two others belonging to the genus *Scymnus*, of which we have no exact records, were introduced between 1890 and 1895. At least seven other species of ladybeetles introduced at that time disappeared a few years later.

The practical results of these introductions are hard to evaluate at the present time inasmuch as the seriousness of the infestations of scale and aphids has not been fully recorded. However, in one place in the Fauna Hawaiiensis, Dr. Perkins mentions the enormous number of aphids found on the trees and shrubs in the native forests before the introduction of the ladybeetles and it is at least reasonable to suppose that similar conditions prevailed in the low lands in regard to the infestation of scale insects and aphids on the introduced flora. The fact, also, that nearly all of Mr. Koebele's earlier introductions were planned to control these pests, indicates that the situation at least was not satisfactory. Today Honolulu is remarkably clean in regard to the infestation of aphids and scales on trees and shrubbery, although the situation has been greatly helped in some respects by more recent introductions. Mr. Fullaway in 1923 has the following to say in regard to a certain class of scale insects: "Undoubtedly the present situation with regard to mealy-bug infestation represents a great improvement over the conditions prevailing, say twenty or twenty-five years ago, and much of this improvement is due to the excellent work done by the numerous species of coccinellid beetles introduced by Koebele from the Orient and Australia."

In consequence of the success of these initial introductions by Koebele, practically all subsequent entomological work in the Islands has been directed along the same lines and one serious pest after another has been either greatly reduced or entirely controlled by enemies discovered in Africa, America, Australia and the Orient by Koebele, Perkins, Muir, Silvestri, Bridwell, Fullaway, Osborn, Williams and Pemberton.

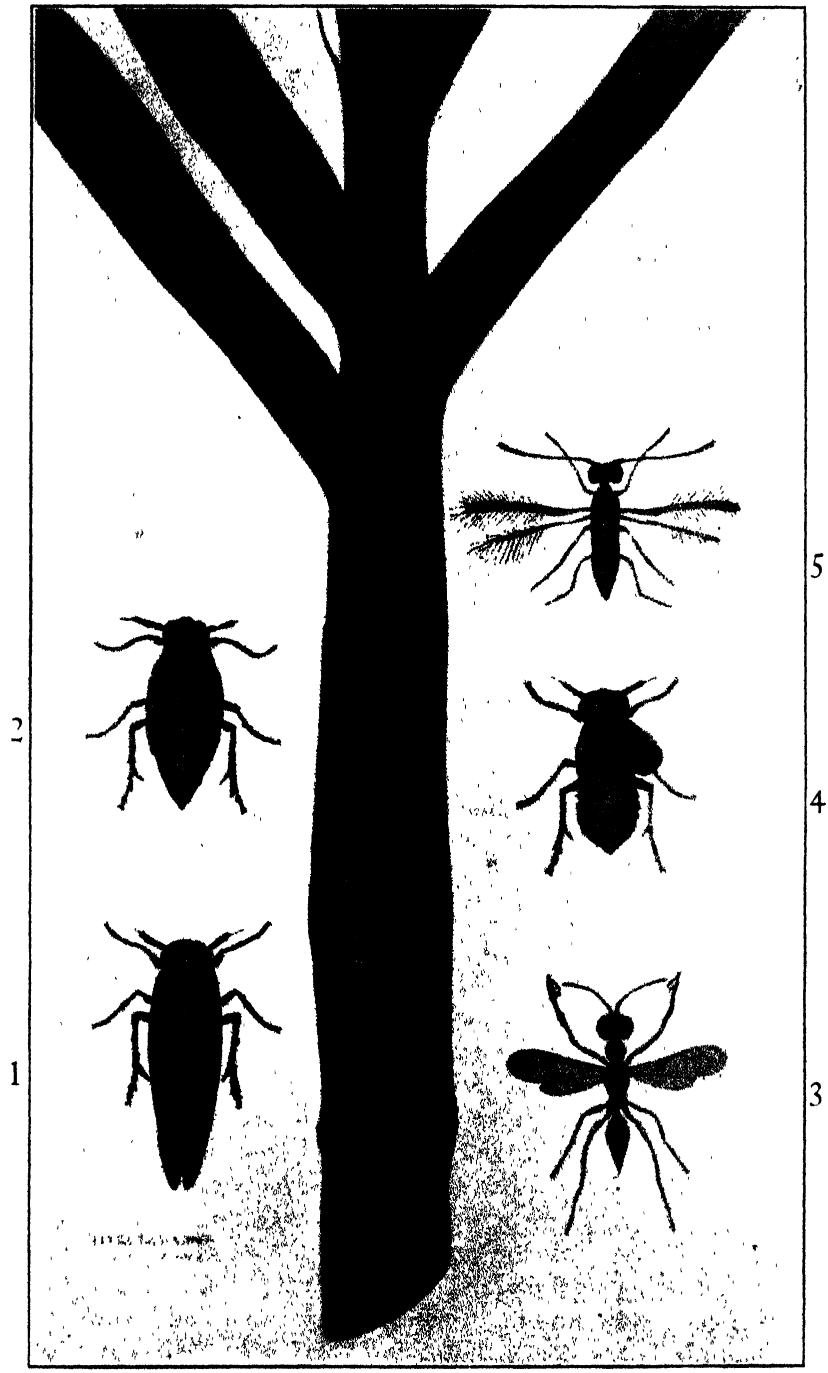
In 1900, the sugar cane industry of the Islands began to be seriously checked by a very small insect known as the sugar-cane

leafhopper (*Perkinsiella saccharicida* Kirk.), which somehow had become established from Australia a few years earlier. This insect is extremely prolific and when multiplying unchecked it increases to such an extent that the sugar cane is badly stunted and finally killed. The adults migrate especially at night from one field to another, flying generally from the older cane to younger fields. By 1904 the situation had become extremely bad and the whole industry was suffering enormous losses and was threatened with entire destruction by this insect. There seemed to be no practical means of combating it, as spraying was impractical on account of the great acreage involved and the jungle-like growth of the older cane. What natural enemies there already were in the Islands, including spiders, ladybeetles, a dryinid parasite, several species of endemic flies belonging to the genus Pipunculus, a native mimesid wasp, a predaceous earwig, etc., were inconsequential in controlling the increase of the leafhopper. Due directly to the ravages of this insect the Entomological Department of the Hawaiian Sugar Planters' Experiment Station was organized in 1904 and Dr. Perkins was placed in charge. Other members of the staff at that time or soon afterward were Koebele, Kirkaldy, Terry, Swezey and Muir.

In 1903, Koebele began investigating enemies of related leafhoppers in North America, conducting most of his work in Ohio and California. Certain parasites were discovered and sent to Honolulu, but without any practical results except, I suspect, that two secondaries, parasites of dryinid cocoons, either escaped or were liberated without knowledge of their habits. At any rate they were discovered in the cane fields a few years later. This was unfortunate as these secondary parasites effectively precluded any efficient control by two species of Dryinidae that were later introduced and established, one from Fiji in 1906 and the other from China in 1907. They also have almost exterminated the Fairchild dryinid, which is possibly a native species, at

EXPLANATION OF PLATE XX.

1. Sugar cane leafhopper *Perkinsiella saccharicida*.
2. Sugar cane leaf hopper *Perkinsiella saccharicida*, shortwinged female.
3. *Echthrodelphax fairchildii.*
4. *Echthrodelphax fairchildii*, larva on young leafhopper.
6. Egg-parasite, *Paranagrus optabilis*.



Cane leafhopper and parasites.

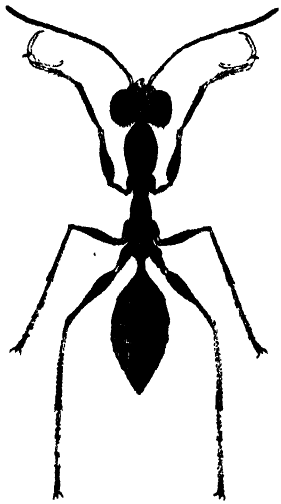
least not known elsewhere and which was first discovered on Kauai in about 1902. This parasite at one time was propagated at the Experiment Station and distributed to the different sugar plantations. Mr. Koebele's work in North America, however, laid the foundation for future work which could not have been conducted otherwise so thoroughly and expeditiously.

In May, 1904, Dr. Perkins and Mr. Koebele went to Australia, where they spent nearly the rest of the year principally at Cairns and Bundaberg in Queensland studying and shipping parasites of the sugar cane leafhopper to Honolulu. The leafhopper was found everywhere present in the cane fields of Queensland, but hardly abundant enough to be injurious and never as numerous as on the least infested plantations in Hawaii. The parasites of numerous other leafhoppers were also studied and over a hundred different kinds of parasites of this group of insects were discovered.

Most careful efforts were made to send the extremely minute mymarid egg parasites to Honolulu but this was successful only after many attempts. Two ways of shipping the material were tried. Small cuttings of cane leaves especially of the midrib were shipped in cold storage but with little success, the low temperature apparently killing the delicate parasites. A more successful method tried later was the use of small cages containing living cane plants on which both leafhopper and parasites could live and reproduce en route.

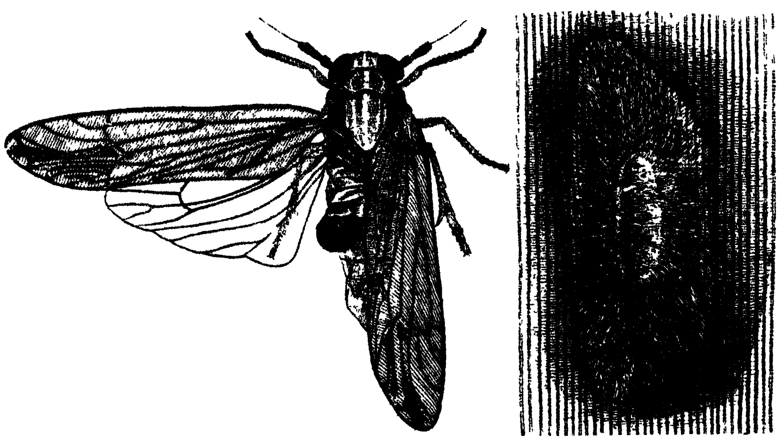
In this way three mymarid egg parasites were successfully introduced, propagated at Honolulu and established as rapidly as possible on all of the plantations. The most important of these species, as subsequent results showed, was the one named *Paranagrus optabilis* by Dr. Perkins. Another egg parasite belonging to a different group and called *Ootetrastichus beatus* Perkins was sent over from Queensland and a little later by Koebele from Fiji. This also became established in the Islands, but did not later prove to be so important as Dr. Perkins thought it might become at the time of introduction. Other introductions of Koebele and Perkins during that year were an epipyropid moth parasitic in the larval stage on the leaf-hopper, two species of *Verania* and *Leis testudinaria* (Muls.), these

three being ladybeetles, a species of Dryinidae and a predaceous syrphid-fly of the genus *Baccha*, but none of these became established.



Pseudogonatopus hospes, female.

In 1906, Mr. Frederick Muir introduced *Haplogonatopus vitiensis* Perkins, a dryinid parasite of the leafhopper from Fiji,



Pseudogonatopus hospes, larva on adult cane leafhopper; and cocoon on cane leaf.

and *Pseudogonatopus hospes* Perkins, another species of the same family from China, the following year. The latter species was lost sight of for nearly ten years but was found well established and widely distributed in the Islands in 1916.

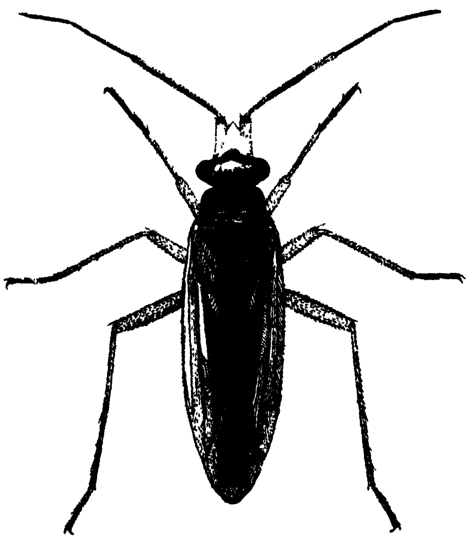
As the result of these introductions and very largely through the work of the egg parasite, *Paranagrus optabilis*, the leafhopper was brought more or less perfectly under control, or at least to such an extent that sugar cane could be grown profitably throughout the Islands; the extremely heavy monetary losses amounting to millions of dollars, that were suffered during 1904 and the few preceding years, were very largely stopped.

Beginning about 1915 and continuing for several years there was a recrudescence of leafhopper outbreaks, involving sometimes nearly whole plantations but only a few plantations at one time. These outbreaks generally started during the cooler winter months and sometimes lasted well into the summer, and on one plantation situated on the windward and wetter side of Hawaii, the condition became chronic and lasted through several years. These outbreaks were due either to conditions unusually favorable to the leafhopper itself or in some cases to conditions distinctly unfavorable to the egg parasites.

On account of these outbreaks it became desirable to import, if possible, additional enemies of the leafhopper, and in 1916 Mr. Muir brought back from Formosa another egg parasite, later described as *Ootetrastichus formosanus* Timb. This species was propagated in Honolulu and distributed from there during the following year, but although it soon became established it failed to produce any appreciable effect on the severity of the outbreaks. In the fall of 1919 Mr. Muir went to Australia and while there discovered that a common mirid bug, *Cyrtorhinus mundulus* (Breddin), instead of being a plant-feeding species like most members of the family to which it belongs, lives instead on the eggs of the leafhopper. After a very careful and prolonged investigation of the habits of this little bug it was decided to try to establish it in Hawaii. When Mr. Muir returned to Honolulu in 1920 he brought along a small number of Cyrtorhinus and Mr. Pemberton soon afterwards departed to Fiji, where the species is also common, to collect and ship

larger numbers of them to Honolulu. This was successfully accomplished and the species was also propagated in cages at Honolulu and distributed during the fall of 1920 and the following winter to the plantations that were suffering most from leafhopper outbreaks. The species was found established on one plantation the following summer and soon had increased enormously and become distributed throughout cane growing areas of the Islands, even appearing on certain Islands where it had not been purposely distributed.

The effect of this introduction was soon apparent. Ewa Plantation on Oahu, where the leafhopper had occurred previously in large numbers year after year, was no longer afflicted. At Mountain View section of Olaa Sugar Co., on windward Hawaii, the leafhopper was also brought under control after several years of continuous and severe infestation.



Cyrtorhinus mundulus, a bug that sucks the eggs of the sugar cane leafhopper.

As the result of the introduction of Cyrtorhinus the biological control of the sugar cane leafhopper has apparently been completely solved in Hawaii. This control came as a result of work extending over a period of nearly twenty years and the investi-

gation of the enemies of the same or related species of leafhopper in North America, Formosa, China, the Philippines, Java, Fiji and Queensland, requiring several foreign trips by Koebele, Perkins, Muir, Williams and Pemberton.

Another important pest of sugar cane in Hawaii is the sugar cane borer, *Rhabdocnemis obscura* (Boisd.), thought to have been accidently introduced by importations of seed cane from Tahiti in 1854 and known to have damaged cane in the vicinity of Lahaina, Maui, as early as 1865. It is presumably native to New Guinea and the adjoining islands, and the original food plants appear to have been sago palm and other palms and banana. It is now widely distributed in the islands of the Pacific and in northern Queensland, but does not occur in Java, Malay Peninsula, Borneo or the Philippines.

This pest had for many years caused losses that have been conservatively estimated at about one million dollars annually for the entire industry. The infestations were always very irregular, in some fields ranging so high that 50 per cent or more of the crop was destroyed. A few plantations that offered more favorable conditions for the beetles suffered much greater losses than others, even up to one-fourth of their total annual crop.

The great success following the importation of the parasites of the sugar-cane leafhopper undoubtedly encouraged the planters to undertake the search for natural enemies of the cane borer, and this arduous undertaking fell to the lot of Mr. Frederick Muir. The work was begun in 1906 and was completed in 1910. In July, 1906, Mr. Muir left Honolulu and spent about six months in southern China and several months in

EXPLANATION OF PLATE XXI.

1. Cane showing work of borer.
2. Adult borer, *Rhabdocnemis obscura.*
3. Egg *in situ* in rind of cane.
4. Larva of borer.
5. Pupa of borer.
6. Cocoon *in situ.*
7. Adult tachinid fly, *Ceromasia sphenophori.*
8. Borer larva with maggots of tachinid issuing.
9. Borer cocoon containing puparia of tachinid.

Rhabdocnemis obscura, its work, life history, and its parasite, the New Guinea Tachinid (*Ceromasia sphenophori*).

the Malay States and Java without finding any trace of the cane borer. Later in the year of 1907 he proceeded to Amboina and Larat and found the beetle in great numbers in Larat in sugar cane, pinang palm and sago palm, but without a trace of parasites. Returning to Amboina from Larat Mr. Muir discovered the beetles there in sago palms and associated with them a tachinid parasite.

The great problem now was to ship this newly discovered parasite to Honolulu alive by a very round-about route, via Macassar, Hongkong and Japan. Mr. Terry was sent to Hongkong to take care of the shipments as they arrived from Amboina. The flies, however, were always dead when they reached Hongkong, due to the poor connections at Macassar. Mr. Muir finally brought a consignment of flies to Hongkong personally but the last ones died for unknown reasons only a day before the destination was reached.

It was therefore decided that it would be impossible to transport the parasite via Hongkong and in November, 1908, Mr. Muir proceeded from Hongkong to Ceram in hope of working out a new system of transportation or of finding another locality whence the parasites could be shipped more easily via Australia and Fiji. In Ceram the beetle and its parasites were both found, but Mr. Muir decided to try New Guinea, which had better means of communication with Australia. Consequently in April, 1909, Mr. Muir proceeded to Port Moresby, Papua, where he immediately found the beetle and its parasite. He decided that the best course would be to stock cages with the beetle larvae, expose the latter to the parasites and personally accompany the shipment to Honolulu. If the flies hatched out en route they were to be kept alive if possible until they reached their destination. Unfortunately for the success of this plan Mr. Muir had contracted typhoid fever in Papua and on arriving at Brisbane was forced to go to a hospital. His cages were forwarded to Honolulu, but the flies had all hatched out and died before reaching the destination. After recovering from the fever Mr. Muir returned to Honolulu to regain his strength before attempting to make another shipment of the parasites from Papua.

On account of the short life cycle of the parasite it was decided that it would be better to arrange breeding stations in Australia and possibly also in Fiji, and in January, 1910, Mr. Muir departed for Brisbane, where he had arranged to meet Mr. Kershaw. A little later Mr. Muir went on to Papua and Mr. Kershaw to Mossman, where arrangements had been made to establish a breeding station. Preliminary attempts to dispatch the parasite from Papua to Mossman by mail having failed, Mr. Muir gathered together a large consignment of parasites and departed for Mossman. Due to unfortunate delays in the boat service Mr. Muir arrived at Mossman on May 5th, about eleven days late, and most of the flies had hatched out and died en route. However, about 90 adult flies were eventually obtained at Mossman from the Papua material and these were placed in cages prepared by Mr. Kershaw. The flies were propagated successfully in the cages and Mr. Muir proceeded to Fiji with a part of the first generation. Before leaving Papua he had contracted malaria fever, from which he had suffered both at Port Moresby and at Mossman. On arriving at Suva he was forced to go to a hospital but not until he had placed his parasites in a suitable breeding cage. On Aug. 9 Mr. Kershaw arrived at Suva with the second generation of parasites bred at Mossman, a part of which Mr. Muir took on to Honolulu on the same boat which had brought Mr. Kershaw, together with material which had been bred in Fiji. Mr. Muir arrived in Honolulu on August 16, 1910, with material from which many flies hatched, and a month later Mr. Kershaw arrived bringing additional parasites which had been bred in Queensland and Fiji. From this material the fly was successfully bred at Honolulu and distributed eventually to all of the plantations, on most of which it soon became established.

The economic results of this introduction which cost Mr. Muir so much time, hard labor, sickness and other hardships, was the reduction of the borer infestations throughout the Islands about 90 per cent and the consequent saving of many tons of sugar annually and many thousands of dollars. Inasmuch as one beetle larva can do considerable injury to a stalk of cane, sometimes causing it to be entirely lost through breakage by wind, even a 90 per cent control may permit of a considerable eco-

nomic loss, caused by the remaining 10 per cent. The control of the sugar cane borer is not perfect therefore, and some preliminary work has recently been conducted towards discovering and introducing additional natural enemies to more thoroughly control the cane borer.

The Mediterranean fruit-fly (*Ceratitis capitata* Wied.) was discovered in Honolulu in 1910, having been introduced by commerce, probably from Australia, a few years earlier. This pest found conditions in Hawaii extremely suitable for its rapid development and increase and not long after its discovery there it was found widely distributed in the Islands and soon increased to great abundance. This was due to the warm equable climate and the large number of suitable fruits ripening in rapid succession. This was true not only of cultivated fruit, but also of wild fruits, the valleys and hillsides in the uncultivated districts furnishing an almost constant supply of wild guavas. Due to the great variety of cultivated fruits and the unlimited supply of wild fruits often close to the cities and towns it was found impracticable to control the fruit-fly by spraying or clean culture. The control by natural enemies did not appear to be any too promising, as the pest was known to exist without any appreciable check by parasites in the Mediterranean region, South Africa and Australia. The Board of Agriculture and Forestry in Honolulu, however, decided that there was a possibility that the fruit-fly was native to the more equatorial parts of Africa and engaged Dr. Silvestri to investigate that part of the continent for natural enemies. This work was planned in the spring of 1912 and in July of that year Dr. Silvestri left Italy for West Africa, visiting French Guinea, Senegal, Nigeria, Dahomey, Gold Coast, Kamerun and the Congo. The fruit-fly was found in Nigeria and Dahomey but it was extremely rare and apparently controlled by parasites. Several species of parasites, some obtained originally from other species of fruit-flies, were then brought from West Africa to Cape Town, where they were bred and then taken on to Australia and from there to Hawaii. Dr. Silvestri left Cape Town on March 26, 1913, arriving at Sydney on April 19 and at Honolulu on May 16. He brought with him *Opius humilis* Silv., *Dirhinus giffardii* Silv., *Galesus*

silvestrii Kieffer, from Africa and *Diachasma tryoni* Cam., which he had collected in Australia.

All of these parasites were successfully propagated at Honolulu and liberated in the Islands, but only the opiine parasites, Diachasma and Opius proved later to be of much consequence.

A second expedition to West Africa was undertaken by Messrs. Fullaway and Bridwell in 1914 which resulted in the introduction of two additional parasites. Mr. Fullaway returned to Honolulu in October, 1914, bringing with him living specimens of *Diachasma fullawayi* Silv. and *Tetrastichus giffardianus* Silv. Both of these parasites were propagated at Honolulu and later became well established. Mr. Bridwell stayed in Nigeria after Mr. Fullaway left, to make further studies on fruit-fly parasites, but was later forced to proceed to Cape Town on account of severe sickness. He made his way back to Honolulu, via Australia, arriving home in the fall of 1915.

These introductions have not resulted in the perfect control of the fruit-fly in Hawaii, but nevertheless have brought about a great reduction in numbers. The parasites have now reached a stage of equilibrim in their control and produce a mortality of about fifty to sixty per cent. The larval habits of the fly make further reduction practically impossible, as the character of much of the fruit infested affords a large measure of protection to the larvae. In the thin-fleshed fruits like the coffee berry the percentage of parasitism rises much higher. But it is possible now to grow fruit in Honolulu, with a fair chance of obtaining plenty for the table, and almost every residence has at least one avocado or mango tree. In fact the people of Hawaii would be disposed to regard the fruit-fly rather lightly if it were not for the stringent quarantine imposed by the mainland, which causes no little inconvenience to the tourists and other travelers.

About the time that the fruit-fly was discovered in Honolulu, another pest of sugar cane began to attract attention. This was *Anomala orientalis* (Waterh.), one of the scarabaeid beetles, which presumably had been imported with nursery stock from Japan or China at least several years before its discovery. As the species spreads very slowly and lives almost all of its life underground it might have been present for years without being

noticed if it had not chosen for its habitat some of the choicest cane land on Oahu. In certain spots on two plantations which naturally came to be called anomala spots, the larvae of this beetle became very numerous and feeding more or less extensively on the roots of the sugar-cane as well as on refuse plant tissues in the soil, they caused the cane to become badly stunted and in many cases killed whole stools of the cane outright.

In 1913 Mr. Muir began to investigate the enemies of this and related beetles in Japan, China, Formosa, Java and the Philippines. Several species of *Tiphia*, a carabid beetle from Japan and at least two species of dexiid flies were sent to Honolulu and liberated in greater or less numbers, without any of them becoming established.

In the Philippines Mr. Muir found that *Scolia manilae* Ashm. works on several allied species of beetles and that it could be readily propagated in small cages or glass tumblers. Mr. Osborn and later Dr. Williams were sent over to the Philippines to assist in the rearing of this species. In the winter of 1915-16 shipments of this parasite began to arrive in Honolulu from Los Banos. The shipments that arrived during the winter gave very discouraging results as very few of the wasps emerged from the cocoons and the few that did emerge had little vitality and died in a few days. It was finally decided that the cold weather encountered by the steamers on the trip from the Orient was proving fatal to the parasites although the shipments were not made in cold storage. It was thought that shipments made later in the season, when the weather became warmer, would produce better results and such proved to be the case. A considerable number of lively, healthy wasps were secured during the summer of 1916 from the later shipments and these wasps were liberated in the Anomala spots. Others were kept for breeding which was carried on successfully until the establishment of the Scolia was fully assured. In September, 1916, much sooner than was expected, the Scolia was found established in the field. By the following summer the wasps had become extremely abundant in the Anomala-infested districts and were collected by the thousands and distributed to the other Islands. This distribution was

undertaken partly to forestall any further spread of the Anomala, but mostly as an attempt to control the related Adoretus beetle which had been a pest for many years on rose bushes, grape vines and many other trees and shrubs throughout the Islands.

Within two years from the time of its introduction the Scolia had brought about a marvelously complete control of the Anomala beetles, and within that time, or later, it also became established on several of the other Islands, thus showing it could work equally well on Adoretus. It, however, has not done nearly as much to control the Adoretus as was hoped for at first and this without question is due to the fact that the Scolia prefers the open, light soils of cultivated lands whereas the Adoretus breeds most abundantly in sod lands. But if the Scolia had saved the day for the sugar-planters and many thousands of dollars in losses to the sugar crop what more could be expected of it? The Adoretus perhaps some day will be controlled by another introduction, such as a *Tiphia*, and doubtlessly it would have been brought under control long before now if it were a pest of one of the staple crops of the Islands.

The armyworm formerly was a pest of great importance in the Islands. After the winter rains had produced an abundant growth of grass and weeds, the caterpillars appeared annually in enormous numbers and devoured almost every green vegetation in their path, frequently invading cultivated crops such as sugar cane. Koebele in the nineties had introduced several parasites, including two ichneumon flies, *Amblyteles koebelei* (Sw.) and *A. purpuripennis* (Cress.), probably from California, and one or two tachinid flies, but better results followed the introduction of the mynah bird. Since this bird was introduced the number of armyworms has been greatly reduced and they now appear in injurious numbers, during the late winter and spring, only locally. They still continued to cause considerable damage to sugar cane on some plantations and remained a pest of considerable importance to the dairy and cattle raising industry, especially at higher elevations on the islands of Maui and Hawaii.

In 1922, Mr. Osborn, who was working in Mexico, sent to Honolulu several armyworm parasites, of which the most im-

portant was *Euplectrus platyhypenae* How. This little parasite deposits a group of eggs on the back of the caterpillar, which in a short time hatch and eventually destroy the host by sucking its juices. The Euplectrus proved to be a very easy parasite to propagate and was reared and distributed in large numbers. Finally, in October, 1924, it was found established in several places on Hawaii. In 1923, Mr. Osborn sent another important army worm parasite from Mexico, which for some reason failed to propagate, but nevertheless was liberated in considerable numbers. This was *Apanteles militaris* (Walsh). It is perhaps too early to say that this introduction has failed, as the parasite may be recovered later.

Several other less important pests have been brought under control or considerably reduced by introduced parasites, but perhaps it would not be worth while to discuss these in as much detail. In 1916, Mr. Fullaway imported *Opius fletcheri* Silv. from India, which has done good work on the melon fly, so that watermelons, cucumbers, and some other vegetables can be grown successfully once more.

In 1922, Mr. Osborn introduced from Mexico, *Pseudaphycus utilis* Timb. and several ladybeetles, which brought about a spectacular control of a mealy-bug, *Pseudococcus nipae* (Mask.), which for years had been a bad pest on avocado, fig, mulberry, guava and banyan trees. This remarkable cleanup was mostly accomplished by the Pseudaphycus, a small, yellow internal parasite, but at least one of the ladybeetles, *Hyperaspis silvestrii* Weise, also became established.

In spite of good quarantine work certain seed-infesting beetles, known collectively as Bruchidae, have been constantly appearing in the Islands until now some ten or twelve have become established. Certain of these cause considerable damage in stored

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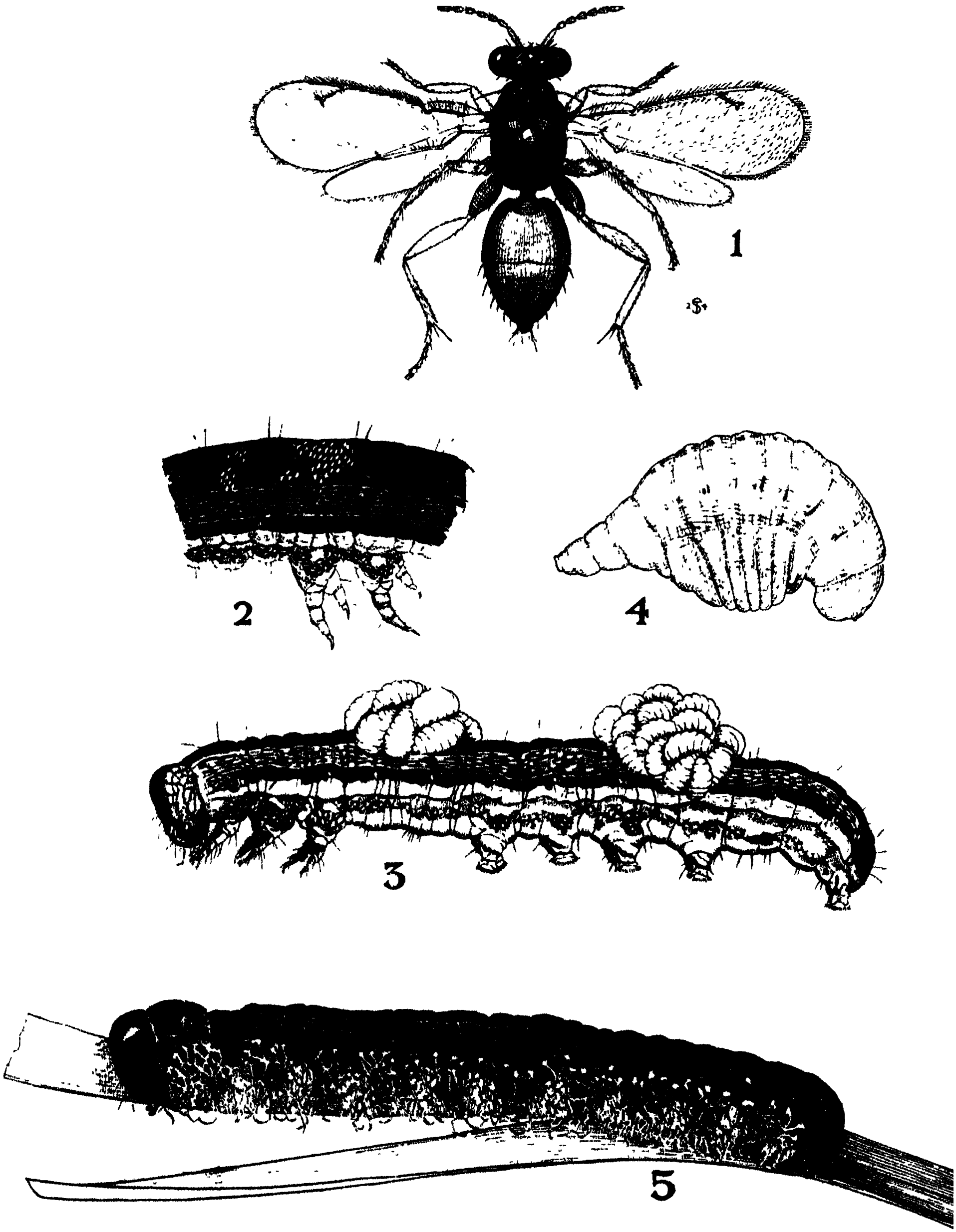
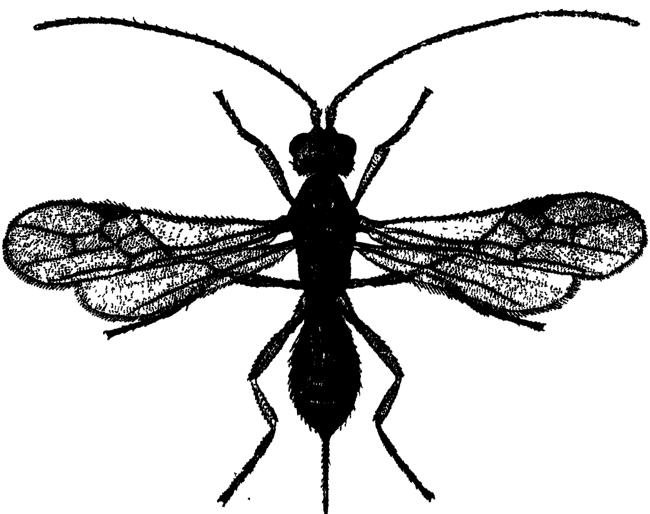
EXPLANATION OF PLATE XXII.

1. Mexican armyworm parasite, *Euplectrus platyhypenae.*
2. Cluster of eggs on armyworm.
3. Parasite larvae on armyworm.
4. Parasite larva, highly enlarged.
5. Dead armyworm fastened to leaf by cocoons of the parasite.



Mexican armyworm parasite (*Euplectrus platyhypenae*) and its life history.

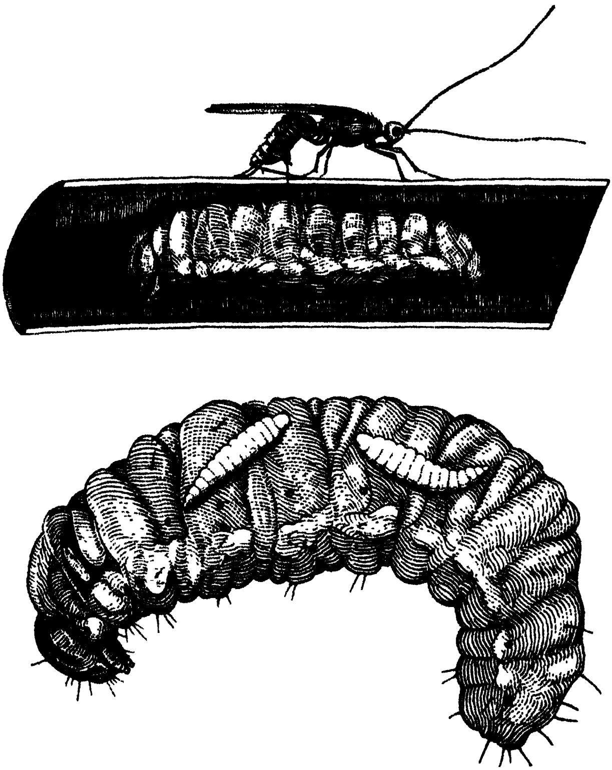
beans, or even attack these in the field. Others attack the seeds of the mesquite, the pods of which form an important item of cattle feed in the Islands. In 1910, Mr. Fullaway brought about the establishment of two parasites, which had been sent from Texas by the Bureau of Entomology. One of these was a tiny egg parasite, *Uscana semifumipennis* Gir. and the other a braconid, called *Heterospilus prosopidis* Vier. The establishment of the latter was not known to the entomologists until 1917, but at that time it was found to be common and a little later it was found widely distributed in the Islands. In 1921, Mr. Bridwell, working for the Bureau of Entomology, collected several other bruchid parasites in Texas, which were brought to the Islands and propagated by Mr. Willard. These include two additional braconid parasites, *Glyptocolastes bruchivorus* Crawf. and *Urosigalphus bruchi* Crawf., also two chalcid flies, *Lariophagus texanus* Crawf. and a species of *Horismenus*. All of these have become established and are doing good work in reducing bruchid infestations in mesquite pods.



Fern weevil parasite (*Ischiogonus syagrii*).

In 1916, Mr. Osborn sent over from Los Banos a small mymarid which is parasitic on the eggs of the corn leafhopper. This is

very similar to the important mymarid parasite of the sugar-cane leafhopper and soon became established. Because of the discontinuous planting of corn both in time and space the parasites of the corn leafhopper do not have much chance to show their real worth, and the leafhopper itself carries over better to the next crop.



Fern weevil parasite ovipositing on fern weevil grub, and parasite larvae feeding on fern weevil grub.

The fern weevil is another Australian immigrant that soon spread to the native forest and threatened to destroy an important element of the undergrowth. The forests of Hawaii have been declining for many years, due principally to the inroads of cattle, wild pigs and goats, and it was a matter of concern to have an insect pest increase the damage. After Mr. Pemberton had finished his work in Fiji in 1920 in regard to

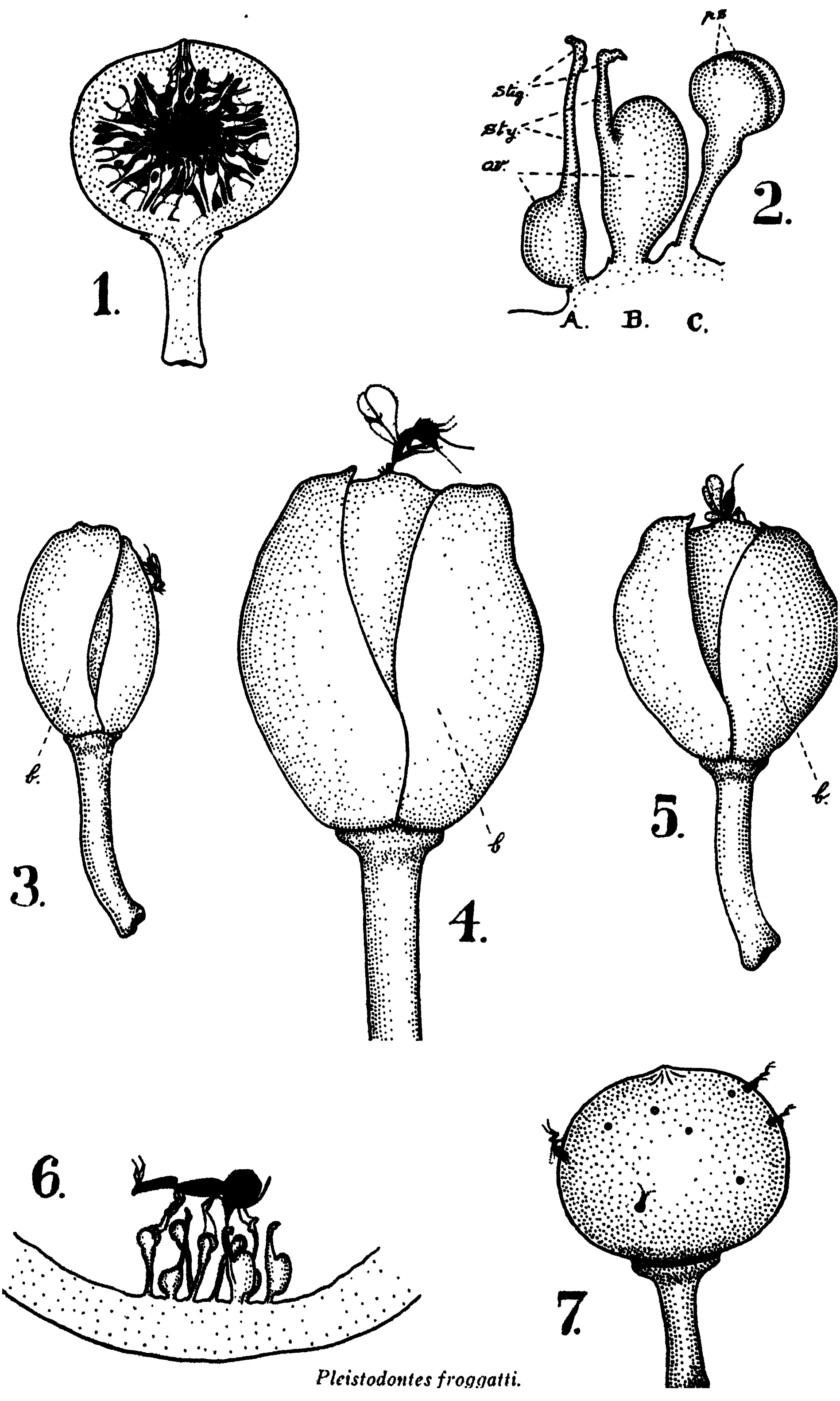
the importation of Cyrtorhinus, he went on to Australia to hunt for a parasite of the fern weevil. Deep in the forests of New South Wales he found the fern weevil and several other related species, although they were rare and well controlled by parasites. The principal parasite was a braconid, named later *Ischiogonus syagrii* Ful., which was sent to Honolulu in 1921. This parasite was liberated in the forests, where the fern weevil was at work, and soon became established. Later investigations show that the introduction of this parasite has been successful in checking the weevil.

At this point it would be well to mention two other introductions made by Pemberton in 1921 and 1922. These were the fig insects, *Pleistodontes froggatti* Mayr, and *P. imperialis* Saund., essential to secure the seeding of two important Ficus trees, *Ficus macrophylla* and *Ficus rubiginosa.* Of these two trees only a few specimens existed in the Islands, and the botanists of the Experiment Station, H. S. P. A., in Honolulu thought they would become valuable reforestation trees, if the insect pollinators that live in the fruit could be introduced and established. This has been accomplished and the trees are now setting large crops of fruit and large quantities of seed have been gathered and distributed in the forests, in some cases by the aid of airplanes. When this work was started in 1920, it was planned to introduce the insect pollinators of several other species of Ficus, but so far this plan has not met with success.

Before closing this account of the beneficial insects introduced into Hawaii it will be necessary to consider another group of insects, quite different from an ecological standpoint from any heretofore mentioned. I have reference to the insects introduced by Koebele in 1902 from Mexico to control or to prevent the

EXPLANATION OF PLATE XXIII.

1. Ripe Moreton Bay fig showing flowers.
2. Flowers of fig highly enlarged: A, female flower; B, gall flower; C, male flower.
3. *Pleistodontes froggatti* on bract enclosing fig.
4, 5. " " entering fig.
6. " " ovipositing in gall fig.
7. " " issuing from ripe fig.



Pleistodontes froggatti.

spread of Lantana. This shrubby plant is a native of the warmer parts of America but has escaped from cultivation in Hawaii, Australia and India. In Hawaii it became a great nuisance to the dairy and cattle men, as it spread so rapidly and occupied valuable pasture land. It was grubbed out with considerable labor and expense only to spring up again from the seed.

The attempt to control a noxious plant by introducing insects that feed upon it was at that time an entirely novel proceeding, and it caused considerable worry and fear to Dr. Perkins and Mr. Koebele lest they introduce some insect of such generalized habits that it could turn from the Lantana to a more valuable plant host. These entomologists, therefore, exercised extreme care in their selections of the Lantana insects of which Mr. Koebele had found many species in Mexico. Some of the most important species which Mr. Koebele recommended from his study of their habits in Mexico, never were received in Honolulu in sufficient numbers to permit their colonization and establishment, but nevertheless eight species of insects were finally established. This list includes two species of butterflies and two moths, the larvae of which feed on the inflorescence, one leaf-mining moth, a tingitid bug that feeds on the leaves and causes them to drop, and two dipterous enemies, one a small Agromyza feeding in the seeds and the other a trypetid forming galls on the stems.

The effect of these introductions has been a steady, gradual decline of the Lantana although now a stage of equilibrium has probably been reached. The plant is no longer feared by the cattle men and does not spring up again from the seed in any great numbers after having been grubbed out. It is still common everywhere through the Islands but hardly produces more than enough seed to keep it from dying out. The introduction of the Lantana insects has therefore been very successful, and although two of the insects have occasionally been found feeding on other plants, these plants have little or no commercial importance in the Islands.

There is a considerable amount of current and uncompleted work on biological control in the Islands. Dr. Williams was

searching for wire worm parasites for several years in the Philippines and South America, and Mr. Pemberton in Australia, but both without success. In the meantime the need and demand for wire worm enemies has greatly lessened, as the pest has proved recently to be less important than formerly and controllable by cultural methods. The need for biological ecological control of the horn fly has been long felt in the Islands by dairy and cattle men and numerous attempts have been made to introduce certain beneficial insects for this purpose from Australia, North America and Europe. These introductions have included both direct enemies of the horn fly, that is, parasites and predators, and also certain insects like tumble beetles and other scarabaeid dung beetles, which either scatter or bury the dung, the establishment of which would tend to lessen the breeding places of the horn fly. This problem is evidently difficult and not much benefit has been derived from the introductions up to the present time; the work, however, has been conducted in a more or less desultory fashion on account of lack of financial support.

Additional work is also needed for the control of Adoretus and the sugar cane borer, as has been already noted. The corn aphis has recently received attention, after the discovery that it carries the mosaic disease from grasses and corn to sugar cane. The control of this aphid to such an extent that it will no longer be feared as a carrier of disease, is, I am afraid, an impossibility. Unfortunately there are already present in the Islands several secondary parasites of aphids, which would lessen the efficiency of any internal parasites and even if a ninety or even ninety-five per cent control could be brought about, this probably would not be sufficient to prevent the aphid from spreading the disease.

The pineapple planters have had some trouble with a mealy-bug, known as *Pseudococcus brevipes* (Ckll.), the injury caused by which, I believe, is mostly indirect. Plants infested with the mealy-bug attract many ants, which crawling about over the flowers are thought to cause cross pollination and the setting of seed. Seedy pineapples are the bane of the packers and the percentage of seedy fruit has been steadily increasing. Mr. Osborn discovered two parasites of this mealy-bug in Mexico in 1922 and Mr. Fullway in 1924 found several others in Panama, but attempts at the establishment of these parasites have so far failed.

In conclusion it would be well to point out one of the main reasons why so much success has been attained in Hawaii with beneficial insects. It is because the insect fauna of the Islands is extremely simple in comparison with that of the temperate zone of the mainland and still much more so in comparison with continental tropical faunas. The introduced parasites are generally free from all secondary enemies and soon increase to their maximum effiiciency.

Yet there have been many failures. Probably not more than one introduction in ten has been established, even if we count only those insects which were introduced in sufficient numbers apparently to insure establishment. A few species have become established after the liberation of half a dozen females, and others have failed after the liberation of thousands of specimens. I believe that many failures of this kind are due to one complicating feature of the fauna, namely the great abundance of an obnoxious ant known as *Pheidole megacephala* (Fab.). Another reason for failure is the transportation difficulties. Many tropical insects which are to be imported have a short life history. They can not stand cold storage, and the long distances that they must be transported make it nearly impossible to get specimens to Honolulu alive. But if no expenses are spared to bring about results even this difficulty can be overcome in one way or another, as in the case of the introduction of the cane-borer tachinid.

Tillyard, Insects of Australia and New Zealand

BY E. H. BRYAN, JR.

It is with special interest and appreciation that persons interested in Pacific Entomology welcome the publication of "The Insects of Australia and New Zealand," by Dr. R. J. Tillyard. Not too much is known concerning the insects of Pacific lands, but this book will be of great help in the study of those having Australasian affinities.

Dr. Tillyard states that this volume was written principally to provide a textbook for students of entomology in Australia and New Zealand. As a textbook and guide to the classification of insects, it compares very favorably with the classical works of Comstock and "A General Textbook of Entomology," by A. D. Imms. But as a comprehensive summary and account of the insect fauna of an extensive region, little known to the world at large, it stands in a class by itself.

The book contains 560 pages, handsomely printed for Angus and Robertson, Ltd., Sydney, by the Eagle Press, Ltd., Waterloo. It is divided into thirty chapters: one each on classification and a census of the groups, external anatomy, internal anatomy, life history, each of the twenty-four orders of insects, the fossil record and origin of the Australian and New Zealand insect faunas, and the collection, preservation and study of insects. This is followed by an appendix giving a glossary of entomological terms, a list of abbreviations of author's names used in the book, and a full index.

Besides the vast amount of valuable information which the author has compressed into this one volume, the chief features to be commended are the numerical summaries, the many and excellent illustrations including colored plates done by Mrs. Tillyard, the original contributions on wing venation and the chapter on fossil insects. Although a book of this nature must be to a large

extent a compilation, in reading this book one has the feeling that it has been produced by an authority who is familiar with the details of every branch of his subject. There are keys to and summaries of each family of insects found in Australia and New Zealand, and the number of species found in each for both regions is given. The whole work is thoroughly up-to-date, and does much to clarify confusions in the modern classification of insects.

Records of Immigrant Insects for 1926

BY THE EDITOR

In this issue of the Proceedings the following immigrant insects are mentioned. Those marked with an asterisk were observed for the first time in 1926. The others have been known before but herein named for the first time. Those marked with double asterisk were previously recorded, but now first named and described.

Ophyra chalcogaster Wied. (Diptera) 353

**Tetramorium tonganum* Mayr (Hymnoptera) 353, 367

**Silvanus* sp. (Coleoptera) 358

**Cryptophagus* sp. (Coleoptera) 358

**Listroderes apicalis* Waterhouse (Coleoptera) 360, 367

Cephalochrysa hovas Bigot (Diptera) 369

**Telenomus nawai* Ashmead (Hymenoptera) 370, 374, 378

**Milichiella* sp. (?) (Diptera) 378

**Coccidencyrtus ochraceipes* Gahan (Hymenoptera) 517

***Elachertus giffardi* Timberlake (Hymenoptera) 519

***Notanisomorphomyia externa* Timberlake (Hymenoptera) 522

Ittys perditrix (Gahan) (Hymenoptera) 525

***Ufens climacae* Timberlake (Hymenoptera) 525

End of Volume VI

PROCEEDINGS OF THE HAWAIIAN ENTOMOLOGICAL SOCIETY

Index to Vol. VI, 1924-1926.

Insect Index by Orders

(* Indicates genera and species new to science. Page references to descriptions of these are in black-faced type.)

HYMENOPTERA

HEMIPTERA-HOMOPTERA

HEMIPTERA-HETEROPTERA

ORTHOPTERA & DERMAPTERA

NEUROPTERA & ODONATA

LOWER ORDERS

PLANTS

ERRATA IN VOLUME VI

PROCEEDINGS OF THE HAWAIIAN ENTOMOLOGICAL SOCIETY

The following errors have been discovered, and should be corrected in the text:

Page 196, line 10, for "*Xanthoxylon*" read "*Xanthoxylum*".
" 220, line 15, for "*Discritomyia*" read "*Dyscritomyia*".
" 233, line 29, for "*Dactylospermum*" read "*Dactylosternum*".
" 242, line 4, for "*Goetze*" read "*Goeze*".
" 249, line 26, for "1924" read "1925".
" 249, line 22, for "*maurita*" read "*mauritia*".
" 292, bottom line for "*Heiroxestis*" read "*Hieroxestis*".
" 343, line 19, for "*Goetze*" read "*Goeze*".
" 348, line 16, for "*lutipes*" read "*luticpes*".
" 381, line 19, for "*Eva*" read "*Evaza*".
" 433, line 6, for "*Xyclocopa*" read "*Xylocopa*".
" 436, line 29, for "*Nesominesa*" read "*Nesomimesa*".
" 437, line 5, for "*Nesominesa*" read "*Nesomimesa*".

" 445, line 9, for "flies" read "tipulid fly".
" 445, line 4 from bottom, for "*Discritomyia*" read "*Dyscritomyia*".
" 445, line 4 from bottom for "*Caenosia*" read "*Coenosia*".
" 487, insert as line 6, "PROTERHINIDAE".
" 493, delete lines 13 and 14.

ERRATA IN VOLUME IV.

(Omitted from list in Vol. IV Index)

Page 336, line 22, for "page 234" read "page 270"
Page 350, line 13, for "3-joined" read "3-jointed".

Date of issue.	Date of issue.	Date of issue.
30.11.51	6.10.64.	
28.7.52	26.4.65.	
7.7.56	16 JAN 19[illegible]	
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9.9.59		
27.1.61		
24.9.63.		
30-5-64		
10-6-64		
1-7-64		
8-7-64		
1-9-64		